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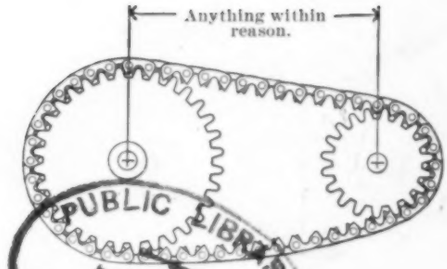
Team Play vs. Star Play



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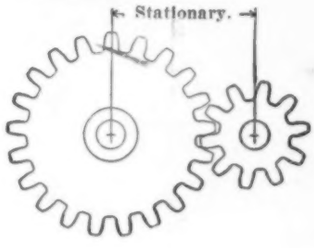

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A Little Common Sense

And Reamer Logic

WHY an up-to-date shop that prides itself on modern shop equipment will use a solid reamer for reaming out large holes, and stuff cotton waste, heavy paper or strips of wood on one side of the reamer so as to make it cut a little larger is rather difficult to comprehend. But it is done nevertheless—and in a good many shops too—possibly in your own shop.

If you use solid reamers the chances are considerably in favor of your men doing it. But it is a poor method—very poor. It not only severely tries the patience of your men, takes up considerable time and spoils the reamer, but also produces an elliptical hole, poor finish and finally a poor fitting. Then your inspector fumes and kicks, the job is thrown out and probably done allover again—at least it ought to be.

More expense—and all on account of a poor reamer—a worn reamer—a solid reamer. The blame probably reverts to the machinist—same old story—innocent sufferer always—just because the purchasing department could save a few cents on a solid reamer which soon becomes scrap.

The P. & W. Adjustable Blade Reamer Is Exact, can be Kept Exact and Will Last a life-time.

In addition, it can be adjusted a few thousandths larger or smaller to give the exact reaming fit desired.

Write for adjustable reamer argument and catalog "Small Tools."

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(*See page* 48)

Guarding Gears on Machine Tools

Editorial Correspondence

How a progressive firm in the Middle West has modified its line of lathes and incorporated in their design suitable guards for completely inclosing all gears in the headstock.

Designs of gear covers that prevent all possibility of injury to workmen at either front or rear of head without affecting the former convenience of operation.

The question of providing machine tools with guards which shall completely inclose all gearing, is one that is likely to receive more and more attention from this time on. Several State legislatures have recently enacted laws requiring such safeguarding of machinery; and certain purchasers of tools, even outside of States making such requirements, are specifying that adequate guards shall be applied to their machines.

A few illustrations of what one progressive firm of lathe builders is doing in the direction of inclosing all the gearing upon its product, are presented in the accompanying engravings. These views show various types of Lodge & Shipley lathes and the modifications which this Cincinnati firm has recently made in order to cover thoroughly all headstock and other gearing that was formerly more or less exposed are represented clearly in the different engravings.

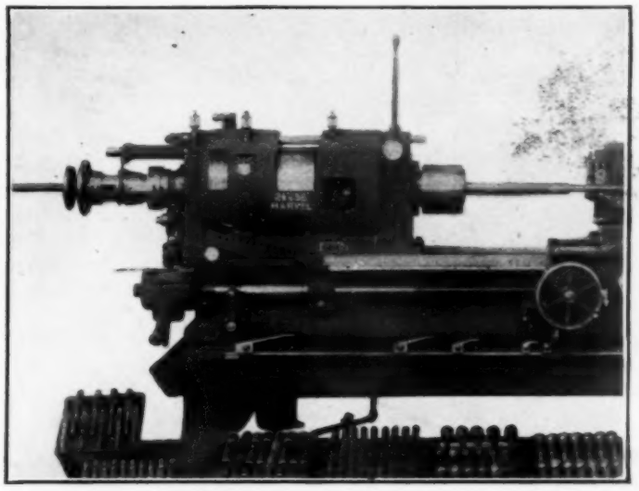


FIG. 1. 2½x36-INCH "MARVEL" LATHE WITH HEAD GEARING PARTIALLY AND COMPLETELY INCLOSED

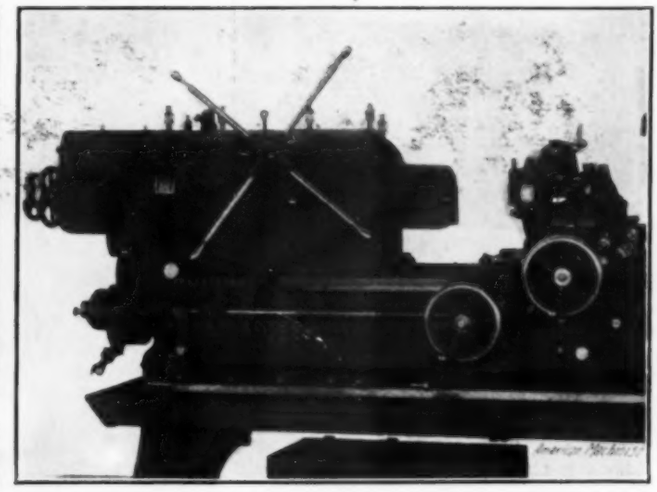


FIG. 2.

HEAD GUARDS IN THE "MARVEL" LATHE

The first two illustrations, Figs. 1 and 2, represent the well known Lodge & Shipley "Marvel" lathe, as built until recently with the head partially guarded, and as now constructed, with all the gearing so inclosed as to render it impossible for the operator to catch his fingers or clothing in the running mechanism. This pair of engravings, like those that follow, are of the "before and after" nature, and the modifications in appearance due to the application of the guards are brought out so plainly as to require very little explanation. This 2½x36-inch machine, like the other lathes shown, is so familiar to our readers that in the views presented, only the head end of the machine is included.

APPLICATION TO LARGER TOOLS

Two of this firm's 36-inch "Patent Head" lathes, one as formerly built with ordinary guards and the other with fully inclosed gearing, are shown by Fig. 5 and 6. As in the case of the machine in Fig. 2, the neat design of the cover surrounding the head mechanism is so well depicted that no comment is necessary.

The 30-inch by 30-foot drilling lathe with variable-speed motor drive, and as it appears without and with the complete gear guards, is illustrated by Figs. 3, 4, 7 and 8, inclusive. These views from both front and rear also bring out the simple and effective method of applying the motors both to the headstock drive and to the drilling attachment upon the carriage. The rear view, Fig. 8, is of especial interest in illustrating the thorough manner in which the driving-gear and back-gear shafts are inclosed without interfering in any way with the attachment of the motor.

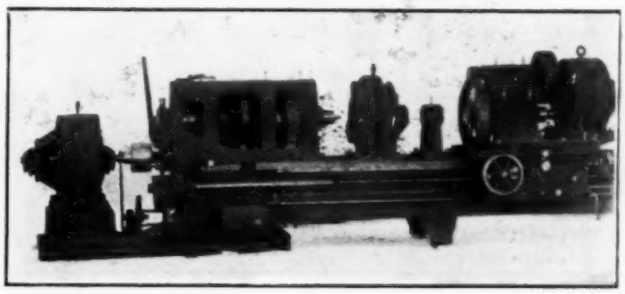


FIG. 3. 30-INCH BY 30-FOOT DRILLING LATHE BEFORE AND AFTER GUARDING GEARS COMPLETELY

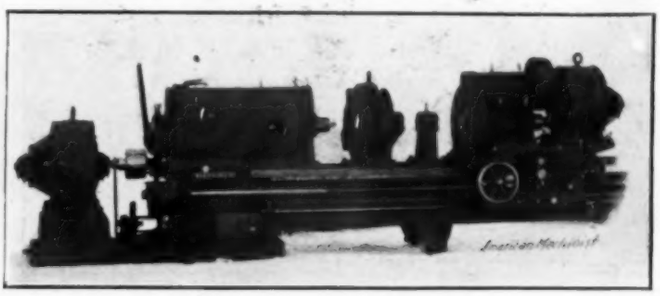
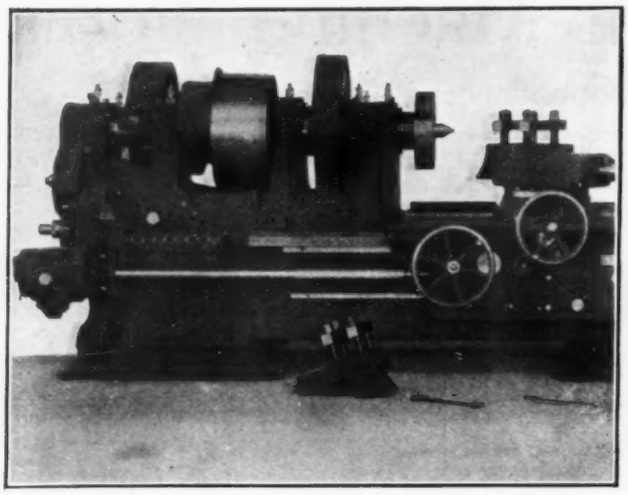


FIG. 4.



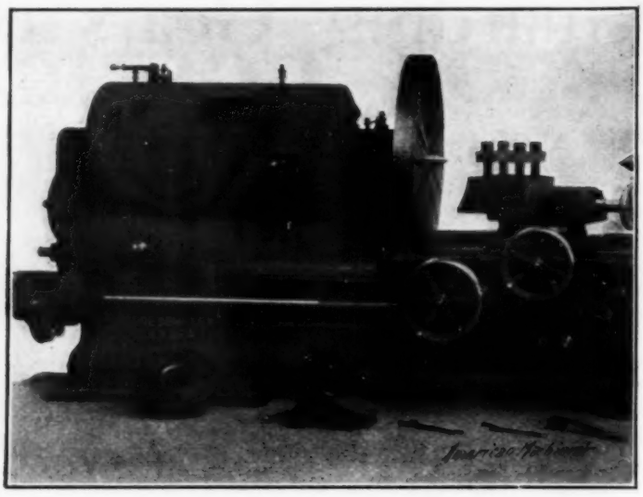
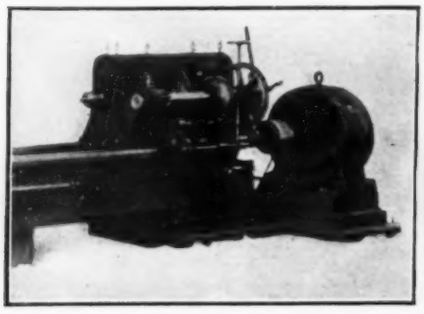


FIG. 5. 36-INCH "PATENT HEAD" LATHE BEFORE AND AFTER INCLOSING GEARS COMPLETELY FIG. 6.

OTHER GUARDS FOR HEAVY LATHES

Figs. 9, 10 and 11 illustrate still another heavy machine to which gear guards have been applied in a most satisfactory manner. This is a 42-inch motor-driven "Patent-Head" triple-geared lathe, and here again the engravings are practically self-explanatory, showing as they do, the way in which the head and change gears, partially exposed in the design illustrated in Fig. 9, are completely inclosed in the later form represented by Figs. 10 and 11. The latter view shows that not one gear is exposed in the headstock or at the end of the head. It also illustrates clearly the coupling by which the variable-speed motor is connected to the drive shaft for the head.



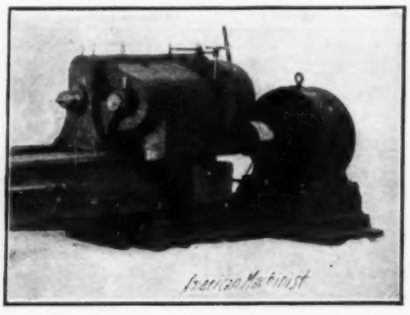


FIG. 7. FIG. 8.

VIEWS OF REAR OF DRILLING LATHE, SHOWING APPEARANCE BEFORE AND AFTER COMPLETELY GUARDING OF GEARS

SOME ADVANTAGES

It must be conceded, upon examination of these photographs, that not only has the primary object of safeguarding the workman from danger of injury in the gearing, been realized in a most effective fashion, but further, as is equally apparent, the life of the machine itself has been extended and its efficiency enhanced by the thorough exclusion of dirt and other foreign substances from its operating mechanism. The design of the guards also adds to the general appearance of the machine itself, and the former convenient features of operation are in no way interfered with.

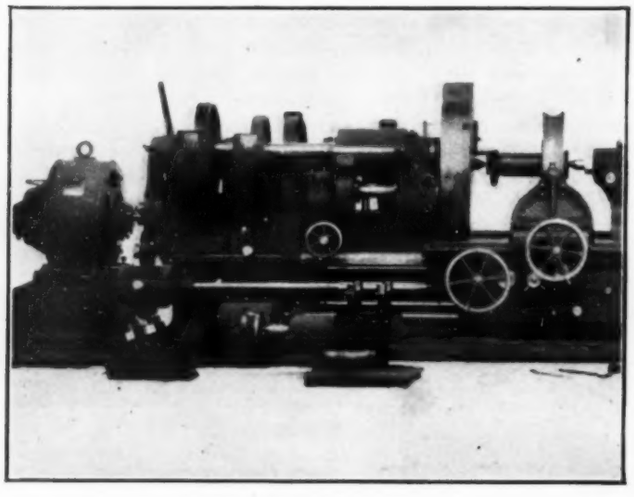


FIG. 9. 42-INCH MOTOR-DRIVEN "PATENT HEAD" LATHE WITH GEARS PARTLY INCLOSED

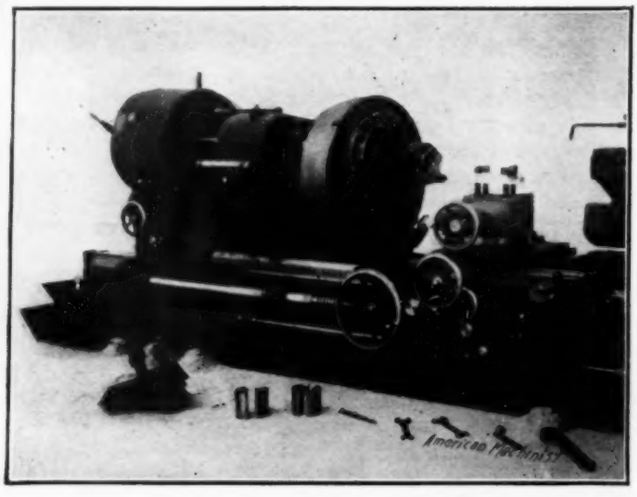


FIG. 10. 42-INCH MOTOR-DRIVEN "PATENT HEAD" LATHE WITH GEARS FULLY GUARDED

What Is to Become of the Machinist?

By Holden A. Evans*

The future of the machinist seems to give some writers and speakers grave concern. We are told that the methods advocated by Fred W. Taylor and his associates are growing in favor and may in time become general, and that when this takes place the machinist must either becomes a planner or gang boss, or drop down to an operator—a machine if you will—at a much lower rate of pay.

This makes a good story, but it is not encouraging to the men in the shops—particularly to the apprentices. Unfortunately many of these, not only the boys but also the men, believe the story. This belief among the men in the shops will not make it any easier for a manager or foreman to make improvements in shop methods. Every change toward better methods will be considered by the men as a step toward the "Taylor system"—the system which they are taught to believe is devised to make machines of them and cheap machines at that. We all know that the majority of men in the shops look with suspicion upon changes and improvements. If we add to this natural inclination by making the workmen believe that the day of the mechanic is over once "Taylor methods" are followed, we can expect and will get violent opposition to every improvement in shop methods and conditions. Intelligent criticism is good; it does much to better methods and conditions. No sensible man will ever object to intelligent criticism of his methods. He should welcome such criticism, and the majority of men are pleased to receive it. We hear today much criticism and talk that can hardly be classed as intelligent criticism.

I shall not attempt to defend Mr. Taylor or his methods; neither he nor his methods require any defense from me. I, however, have heard some of the loose criticism of these methods; I have heard ridiculous criticism of others who have attempted improvements in shop methods; I know that this kind of criticism has a bad effect in the shops and is retarding advancement toward efficiency.

FIG. 11. REAR VIEW OF HEADSTOCK OF 42-INCH MOTOR-DRIVEN LATHE WITH GEARING COMPLETELY INCLOSED

It is a common occurrence to hear severe general criticism of these methods, and on investigation to find that the critic has not the slightest conception of the methods which he attempts to criticize. A short time ago I heard of a very amusing case of this kind. A head of department in a large industrial establishment criticized severely "Taylor methods," and stated that the so called scientific methods consisted of a lot of red tape and blank forms, and that this was to be expected of a man who had never served in a shop—a bookworm sitting in a swivel chair attempting to tell others how to run their shops. This critic knew nothing of the methods he criticized.

It, however, appears that there are some who do know these methods who fear if they are generally adopted there will be little need for machinists in the future. It is stated that, with every detail operation planned for a workman, there will be little need for skill and ingenuity on the part of the man and that he will be nothing more than a part of the machine.

The poor bridge-whist player who does not know the leads, and does not respond to signals, will tell you that he does not believe in playing by rules, that there is little to the game if everyone plays in accordance with the conventions accepted by all good players. Those who know realize that, on the contrary, there is a great deal to the game when conventional leads, signal and plays are followed. Situations arise in every game which require judgment and skill on the part of the player and to be successful a player must be resourceful, alert, and play with judgment.

In a measure, the same conditions exist when the mechanic is working in accordance with detail instructions; there will always be opportunity for him to use judgment and ingenuity. Unusual conditions which cannot be foreseen will repeatedly present themselves, and the man who has skill, judgment and ingenuity will be able to meet these. The day will never come when there is no place for the skilled machinist. Today there is great demand for such men; on every hand one hears complaints of inability to obtain such men; and there is a general demand that apprentice systems be improved in order that there may be a larger supply.

The differences between employers and employees are already too great. It surely is not wise for managers, engineers and writers to make these greater, to lead the men in the shops to believe that their trade is doomed, when such is not the case. The progressive manager or shop superintendent has sufficient difficulties without unnecessarily adding to these. Those who are interested in advancement, who hope to see great improvement in the industrial methods of this country, should not look lightly on the attitude of the critics who are teaching the men in the shops that in a few years there will be little need for mechanics. They are not putting up a straw man which can be easily knocked down; they are building in the shops a stone wall of ignorance and lack of foresight, and this wall is growing higher and higher, and thicker every day. This wall will impede progress, will prevent real efficiency. Owners and managers will have to spend great energy and much money to demolish this wall before the march of progress can continue.

*Naval constructor, United States Navy.

An Innovation in Wage Scales

By Albert Halstead *

An interesting experiment in the regulation of wages in which merit and fairness seem to be the aim of both parties.

*U. S. consul at Birmingham, Eng., in Consular Reports.

If the Brassmasters' Association and the National Society of Brassworkers and Metal Mechanics support the unanimous decision of a Brit h conciliation board selected to settle a dispute as to wages, a new rate of wages will soon become operative under which workers will be graded according to their qualifications and capacity.

This method of grading the wages of workmen is, I understand, wholly new in the relations between employees and employers in the United Kingdom. If the scheme becomes operative, as there is every reason to believe, there will be an incentive to workmen to do the best they can with a view to improving their own wages and consequently their own condition. When contrasted with the prejudice which prevails in some trades against a bright workman working to the total of his capacity, this innovation is quite notable.

Workmen Graded According to Ability

The rates of wages to be paid brass workers according to the grade in which they are placed will be the minimum, and, I understand, the wages will advance with the qualifications and capacity shown by the workmen in each grade. The rates of wages are not yet made public, but the grades of workmen are announced. Full opportunity will be afforded workmen to prove their qualifications and ability.

The proposed arrangement is the outcome of long negotiations between workmen and employers, resulting from the activity of the secretary of the brass workers' organization, W. J. Davis, against alleged sweating in the brass trade. A conciliation board of thirty-two members, comprising equal numbers representing the brass workers and the employers, was appointed. The brass workers proposed a schedule of wages which did not meet with the approval of the employers, who proposed as an alternative a system of grading, which, after full discussion and some modification, was agreed upon unanimously by the conciliation board. The unanimity of the agreement is a most encouraging feature at a time when there has been marked unrest in labor circles throughout the United Kingdom.

What It Is Hoped to Accomplish

The agreement, it is stated, which has yet to be approved by the employers and employed, advances wages over those at present paid, and it is intended to absolutely do away with sweating in the brass trade. At the same time it is hoped to result in a much closer relationship between the brass-trades schools of the district, which is the center of the brass trade of the United Kingdom, the employers and the workmen, and it is hoped that it will also result in such improvement of the quality and character of the work as to materially strengthen the trade.

According to the agreement there are five grades of workmen to be provided for, and each grade is to be denoted by different colored adhesive stamps to be affixed to a membership card. The grades are as follows:

A. Improvers of 21 years of age.

B. (Green grade.) Qualifications: 21 years of age. Dressers who can turn, file over at the vise and are used to tapping and plate screwing. Polishers who can rough, plain mop and emery bob. Ordinary dippers and common bronzers. Common burnishers on lathe and vise.

C. (Brown grade.) Qualifications: 21 years of age. Dressers who can turn and screw inside and out, file flat and true at the vise. Polishers, colorers and all-round roughers. All-round dippers and bronzers. Advanced burnishers on lathe and vise. Repairers and chasers.

D. (Blue grade.) Qualifications: 21 years of age. Dressers who can turn, screw inside and out, file square and flat at the vise and finish own work throughout. Polishers who can do all processes and finish into lacquering room. Expert burnishers and pattern chasers. Art bronzers and colorers with a practical knowledge of the art of coloring.

E. (Red grade.) All previous qualifications plus capacity for working to scale drawings or blueprints or efficient patternmakers.

How the Grades are Made

It is arranged that the grade card shall be handed to the workman by the society and shall have provisions for his number at the factory at which he is employed, the name of the society and his name and signature. These various grade cards are to be issued by the executive of the brass workers' society, but the employers shall have the right to challenge the qualification of the holder of any ticket and require him to submit himself to an examination by the managers of the municipal brass-trades school in conjunction with representatives indicated, one by the association of employers and the other by the society of brass workers, who in no case shall be interested parties and whose decision shall be final. If the decision is in favor of the workman, the employer is to pay a fee of 10s. ($2.43) to the municipal brass school.

Should the decision be adverse to the workman, the society shall have discretion to put such workmen back one grade, but in either event the employer is not bound to reinstate the workman whose qualifications have been challenged. The examination is to include the various processes in the workman's particular branch of the trade, and the result of the examination is to be indorsed on the workman's card. If three adverse decisions are indorsed, the workman shall be put back one grade.

How Advances May Be Secured

When a workman has been duly graded by the society, he shall have the right to qualify for a grade higher by submitting himself to an examination by the authority constituted as mentioned above if required to do so by his employer. His work and capacity shall be examined in connection with a representative nominated by the association of employers and with one nominated by the society of workmen. If the decision is favorable to the workman, the employers are to pay a fee of 10s. ($2.43) to the municipal brass schools; if the decision is adverse the workman or his society is to pay the fee, and the workman is to remain at least six months in the same grade as he held before the examination. It is hoped that it may be arranged that the distribution of grade cards may be made the joint duty of the society and the managers of the municipal brass school.

Conditions as to overtime are to continue in accordance with the award of the late Sir David Dale, made December 10, 1900:

Where workmen are desired by their employers to work more than 54 hours in any week, time and a quarter shall be paid for overtime to day workers, and in case of piece workers that the piece-work earning shall be supplemented by a payment of one-fourth of what the workman would be rated at per hour if and when working by time.

One week's notice is to be given by either party to terminate an agreement whether the workman is working day or piece work and the notice is to be given at the end of the working week in each respective factory.

There are two common mistakes made which often prove costly: Wasting fine brains on routine work and trusting fine work to routine brains.

Shop Efficiency and Railroad Rates

Special Correspondence

Testimony before the railroad commission turned to scientific shop management and emphasized the need of conserving both labor and time as well as natural resources.

The testimony given before the Interstate Commerce Commission on Nov. 21, 22 and 23, to show what scientific management had accomplished to lower the cost of production of manufactured articles, and how the principles of scientific management were applicable to the larger portion of the railroad business, has produced a profound and, from some points of view, a wholly unexpected impression, both upon those who heard the testimony and upon those others to whom the actual hearers expressed their own sense of meaning of this testimony. So far from the rate question seeming to be merely a "commercial" question, it appeared on the contrary that the testimony of the "efficiency" witnesses opened the whole matter of American effectiveness in the use of capital, of labor, of materials, and of time.

Mechanical engineers and machinists as a class can view with a considerable degree of complacency this wholesale opening of the question of inefficiency of our manufacturing processes. For although it must be frankly admitted that the vast majority of machine shops have still much to learn, and much also to do, before they represent the obtainable maximum of efficiency, yet it was from the machine shops that the modern science of efficiency management took its rise, and there has proceeded the greater part of its development up to the present time. It was Taylor, Gantt and Emerson, all of them mechanical engineers, who did the pioneer work of scientific management in the machine shop itself, from which they have extended its application to other industries.

Out of the great mass of detail presented before the Commerce Commission some general topics should be spoken of in order to suggest the bearing of the testimony upon the larger industrial affairs of the country.

Wage Payment Systems

The workmen's interest in scientific management is one of these main topics, and one whose scope may not be wholly clear without a bit of careful consideration. The wage basis of payments to workmen or operatives in shops or mills where scientific management has been installed is the prevailing day wage for the particular industry and place as a minimum; plus a bonus or excess payment which the worker may earn in addition to his daily wage rate by performing his separate pieces of work within the time limits determined by scientific study of the operation. During the hearings in Washington an effort was made by counsel for railroads to confuse the wage system of scientific management with the ordinary piece-work rate with which we are all familiar; and it was necessary for several of the witnesses to explain in detail the fundamental differences between the two.

The reasons why the unions oppose piece work was explained in the testimony of Harrington Emerson, who showed how, in the first place, a piece rate calculated under the ordinary system to give the workmen a living wage was cut down by the management of the shop as soon as the workman had so standardized the operation and improved his skill that he made more than the average daily wage. All the scientific management witnesses insisted that the establishing of a reasonable standard of time for the workman's operation, and strict adherence to the bonus scale when that had once been outlined, was absolutely essential to this system of wage payments under scientific management. Under such scientific conditions most workmen earn a bonus in addition to their day wage, and to this they are absolutely entitled, not only as a payment for their higher efficiency, which increases the profits of the employer, but because aiso this is the only way to secure the all-important coöperation between the workmen and the employer. The relation of scientifically managed shops and industries to the labor unions was one of the most important points cleared up by the testimony of witnesses who had practical contact with this particular matter. There was entire agreement upon the statement that the unions interposed no obstacles after they were convinced that the scientific management shop would pay the minimum day-wage rate prevailing in the trade and locality concerned. The foremost object of the labor union is to create and maintain a minimum wage, and so long as this is assured to its members it gains nothing by laying down a maximum wage.

Another item on the labor side of the matter is the greatly increased opportunity of advancement which scientific management opens to the worker. Scientific management depends upon the work of a relatively large number of observers, investigators, and teachers, gang bosses, speed bosses, and inspectors—who are most easily procured by promotion from the ranks, and this need of numerically large supervision has in actual practice operated to discover, develop and reward especially competent men from among those who were supposed to be merely common workmen. It is not the least virtue of scientific management that without increasing the workman's hours of labor it gives him not only a higher rate of wages, but the sense of dignity in his work and pleasure in his more capable performance, which in the machine shops of the present day are most conspicuous by their absence.

Scientific Management and Future of the Manufacturer

On the matter of the future of the manufacturer as it is affected by scientific management, the testimony of Henry R. Towne, president of the Yale & Towne Manufacturing Company, is of particular significance. Mr. Towne is an engineer in whom age has not dulled or slowed the scientific vision. He told the commission in his testimony that the conditions of competitive business had brought his company to the point where some radical improvement in its methods of conducting the business were absolutely essential to its prosperity. He testified to the same kind of reduction in unit costs of production that was described by other witnesses, men in actual managing control of shops; and he gave it as his opinion, both as a business man and as an engineer, that if his competitors did not themselves speedily adopt scientific management they would invite destruction on the same reef of inefficiency and excessive expense that had once threatened the safety of his own company.

As applicable to the affairs of the railroad companies of the country the professors of scientific management showed in their testimony at Washington a sanity and moderation of view which, as scientific men, they were bound to live up to; and it was evident, both by the comment of those who heard the testimony and by the comment of those who got their impressions from the reports of the listeners, that this attitude of exact and reasonable precision on the part of the witnesses had made a deep impression.

In truth, the whole effect of the testimony, beyond its relation to the immediate question of freight rates, is to set before the public—and this includes specifically our manufacturers and our workmen—a higher but attainable measure of efficiency in the use of capital, labor and of time that should be an inspiration to a concerted and earnest

campaign for the more effective use of some of our greatest resources. The questions raised by this testimony are, in fact, the very largest. They include the vital question of labor, a much greater efficiency for capital as represented in shops and machinery, and what may be called in a very far from jesting sense, the conservation of time. The scope and number of the reasonable applications and implications of the record of efficiency management as applied to the vast complex of our industrial and commercial life cannot be followed in this brief report, but the serious student of affairs will see in these applications the promise and assurance of much desired changes.

Manufacturing an Accurate Pawl

By A. C. Lindholm

The troubles encountered in making an accurate pawl in quantities on the milling machine. These were finally overcome by making the pawls in the punch press from sheet metal.

The pawl, Fig. 6, is used in a well known adding machine. Eleven are used in each machine and the working points must be absolutely correct to gage; otherwise they are useless.

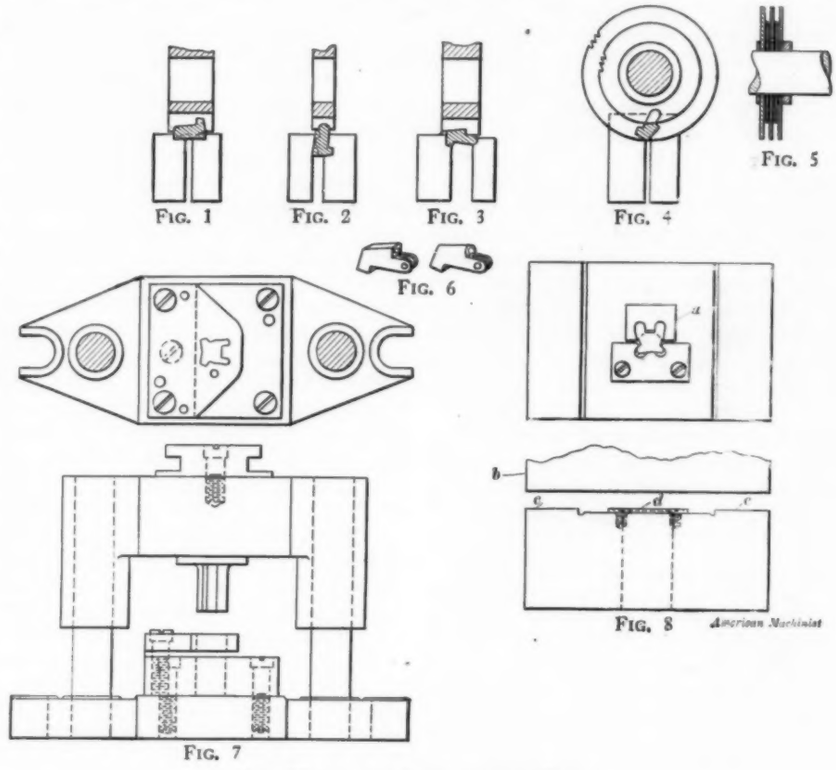
Being one of the multiple parts, the question of economy is, of course, an important item, and the method of making during the early period of manufacturing was as follows: The pawls were first blanked from stock about 0.140 inch thick. The product, of course, was very rough with a bad break, due to thick metal, so it was necessary to flatten them. Milling cuts were then in order, using special vise jaws and formed cutters; also a slotting operation and finally the drilling.

This method proved expensive. The piece required burring after each milling operation, and the percentage lost through so many handlings was excessive. Therefore, the scheme was abandoned and the method shown in Figs. 1, 2, 3, 4 and 5, was adopted, with but little better success in regard to saving of time. The method, as shown, was to mill the strips to form in six-inch lengths and then cut them to the correct width, slotting them at the same time. This was economical, as it did away with a number of burring operations, but the cost of trying to cut the pieces to length with an arbor on which slotting and cutting-off saws were mounted was too great. Numerous methods and lubricants were tried to prevent the saws from breaking, but with no success. The time consumed in repairing an arbor with broken saws and trying to maintain accurate pieces was too great. Also the patience required by the toolmaker in assembling and disassambling an arbor, was about the limit; hence the time had come where some change must be made so as to be able to produce pawls.

I, having the problem to solve and being a firm believer in die work, brought about the new design and method of making them. The design is the same in regard to outline and size, the only difference being a round back, as shown in Fig. 6 to the right, due to the folding. There is this much to be said in regard to sheet-metal work; that is, more accurate work can be obtained from good dies than the best of milling machines and formed cutters. If dies are properly constructed and alined, the first and last piece are the same. This cannot be said of milling operations, as the errors made and chances of making them are too numerous.

Fig. 7 shows the first operation, namely, blanking. The die is of the ordinary type, except for the post construction. The second operation is done in the drop with a box die, Fig. 8. At the same time, the wings or ears on the pawl are depressed or thinned so that when folded it has the slot required. The die is made from good tool steel and the inserted piece *a* has a sharp edge, so that when the force *b* strikes the blank, a good depression is made with a square shoulder and the ears are spread out to the proper shape. The raised surfaces *c c* prevent the force or hammer from flattening the piece too much. The gage *d* is for holding the blank in proper position. The surface being a trifle below *c c* prevents the hammer from striking it. The third operation is shown in Figs. 9 and 10. The piece can be handled as the die illustrates, or bent first, and the closing operation made a separate one. Practice, however, determined that the best method was to shift the work from the blending die, as it saved the handling of the pieces the second time. Fig. 9 illustrates the gaging of the piece in the bending and closing operations, the gage *a* being undercut at *b* to allow the flattened ear to be placed under it. The thickness of the gage at this point is about 0.001 inch less than the required slot. This prevents the punch from closing the blank too much.

In the method illustrated by Figs. 1, 2, 3, 4 and 5, the last operation before the final burring was drilling the holes. A



The Work and Some of the Tools

large percentage was lost by this operation alone, due to not placing the piece in the jig properly, and the inability of the operator to keep the jig free from chips, so that when gaging the piece for final inspection, the working faces of the pawl would vary anywhere from 0.001 to 0.005 inch.

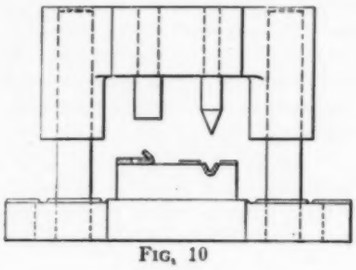


FIG. 10

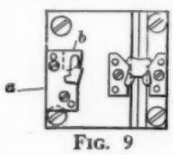


FIG. 9

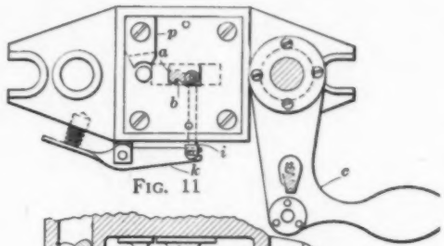


FIG. 11

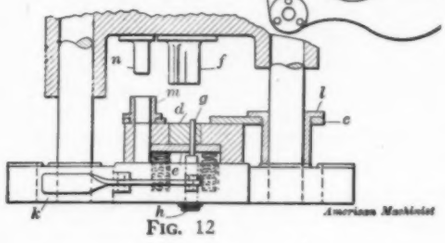


FIG. 12

BENDING, CLOSING AND SHAVING OPERATIONS

In making by the new method, the piece was drilled after bending and closing; then placed in the shaving die, Figs. 11 and 12, and the working points shaved. The result was a saving of 100 per cent. of the pieces.

In this illustration, Fig. 11, the pawl is shown in dotted outline on the die; also the position it occupies in the swinging nest *c*. The working points of the pawl; that is, the points or faces that are gaged in relation to the hole, are from *a* to *b*.

This type of shaving die differs from the ordinary kind; that is, the work instead of being forced out through the die is brought back by means of the ejector *d*, Fig. 12.

Constructed on the sub-press plan, the die is recessed to receive the pad *e*, which is fastened to *d* by screws. In making the punch *f* the ejector is taken into consideration so that the length of the punch includes that part of the locating pin *g*, which passes through the ejector and also through the bolster and is retained in position by a flat-leaf spring *h*, shown in cross section in Fig. 12. In operating the die, as the punch descends forcing the work and ejector downward, the pin *g* also descends until it is locked by the sliding bolt *i*. As the punch ascends, the work and ejector follow, but the pin being locked, remains. This allows the swinging nest *c* to remove the work readily without interference, and the return of the nest over the die preparatory to receiving another blank. The lever *k* is pressed, and in doing so, the bolt moves outward, releasing the pin *g*, which returns to the position shown in Fig. 12.

The swinging nest *c* is attached to a bushing *l*, fastened by screws. Another bushing *m*, into which the pilot *n* operates, insures proper location of the nest in relation to the die. The plate *p* besides being a temporary stop for the nest, also prevents it from lifting when the work is being pushed back by the ejector.

In conclusion I would like to add with regard to the piece described; that the advantages gained by transferring the work from the milling department to the press room are accuracy in production, which had to be attained at any cost and, the assurance that the work is always coming through correctly, as regards quality and quantity.

The Plaster of Paris Core Box

By W. R. Humelbaugh

An illustration of where this kind of material can be used to good advantage in making core boxes under conditions which often obtain.

The method used in handling the job illustrated by the accompanying cuts is out of the ordinary and will doubtless be of interest to many patternmakers who do not happen to be familiar with plaster of paris and the saving in time that can be accomplished, in the making of some kinds of core boxes, when but few castings are required. Its use would hardly be practicable, where more than a dozen castings were to be made, as the plaster core box will not stand the knocks that it gets in the foundry as well as its wooden brother. In cases such as the one here described, however, when castings are wanted in a hurry, it is a material of wonderful value to the patternmaker.

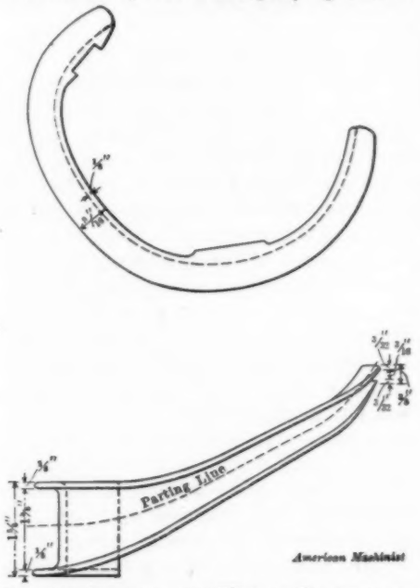


FIG. 1. CASTING FOR WHICH PLASTER OF PARIS CORE BOX WAS MADE

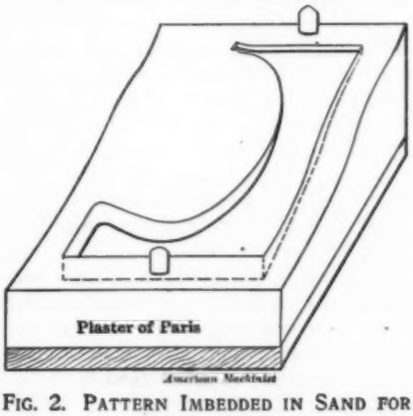


FIG. 2. PATTERN IMBEDDED IN SAND FOR THE FIRST CAST

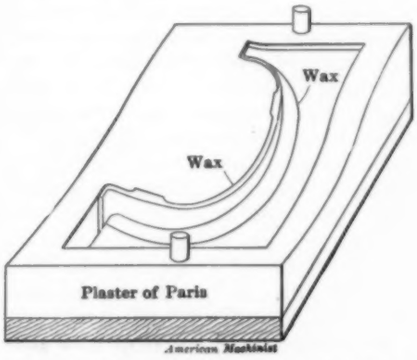


FIG. 3. HALF OF FIRST PLASTER CAST WITH WAX WALL AND WIRE GUIDE

The casting for which this core box

was made was an aluminum wire guide and was shown in Fig. 1. There was to be practically no machine finishing and as can be seen from the cut the job was rather an awkward coring one. Two castings were wanted in a hurry, and the use of plaster of paris for the core box made it possible to get this part of the work finished in one-fourth the time that would have been required for the construction of a similar wooden one.

The pattern and core print were, of course, made of wood and given two or three coats of varnish. Then the patternmaker became a molder for the time being. The pattern was imbedded in the sand to the parting line, for a preliminary core box, as shown in Fig. 2. Care was taken in making the parting and in getting the surface as level as possible and the pattern was then given a coat of oil. A wooden frame, previously prepared, was then placed over the pattern and the inside packed with sand to prevent the plaster of paris from leaking through. The plaster was next poured into the frame until it came to the top.

It was then let stand for from a half to three-quarters of an hour. The pattern and plaster form were renewed from and a cast of each mold taken to secure the sand, the face of the plaster given three or four coats of shellac, the opposite side of the pattern oiled and the

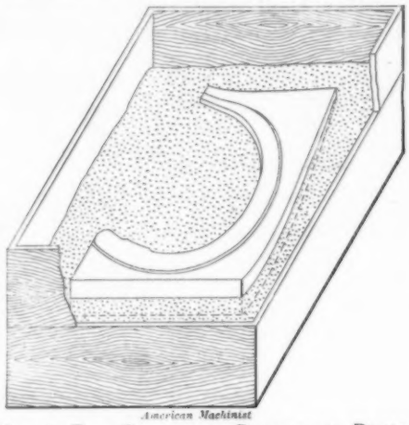


FIG. 4. THE COMPLETED PLASTER OF PARIS CORE BOX

other half of the cast made in the same way.

The walls and flanges of the wire guide were now pushed into place, as shown in Fig. 3, in the molds just completed with modeling wax—clay may also be used—the form of the core.

From this core two more casts were made, and parted as nearly in the center as possible, and the final core box was complete, as shown in Fig. 4. The halves of this corebox were now drilled and doweled and the job was finished.

The two castings were as nearly perfect as it is possible to make castings and were in use on the machine for which they were intended before the pattern shop would have finished the wooden core box.

In the use of plaster of paris there is one very important thing to be considered. Care must be taken in drying the plaster molds. If they are subjected to too great heat the plaster loses its life and crumbles. It has been found that drying in the open air or near steam coils is most satisfactory.

When properly dried the core box will last a long time with careful handling, and be good for a dozen or more cores. The chief recommendation for the use of this material lies in the quickness and accuracy with which the core box can be turned out.

Sammy's Shop—Old vs. Modern Tools

By W. Osborne

Sammy is inclined to doubt the statement that it always pays to use first class uptodate machinery in the machine shop.

Sammy used to think that there were some things that were so self evident that argument on the other side would be an absurdity. One of these things was the statement that it pays to use first class uptodate machinery in a machine shop. Sammy never thought of disputing or even doubting it himself, and acted on his belief as far as he could see his way clear financially.

You understand, Sammy *used* to think that. Now he begins to wabble a little. As a general proposition he still thinks it is true, but at the same time he thinks that there may be exceptions.

One exception came to his notice in this way.

Those of you who are acquainted with Sammy's shop know that it is in line to do all sorts of work. There is a six-foot horizontal mill, a five-foot radial drill besides several assorted sizes of standard drill presses, lathes from 36-inch down, a planer and a shaper, a milling machine (a late addition, and one that he is proud of) a late-model bolt cutter, etc.

These tools are all modern and are all in good shape to do good work. This is not really a manufacturing shop. There is a line of new work that is carried on and with it the shop does general jobbing and repair work. A large part of the business is the repair work and it is the part that has begun to make Sammy wabble in his ideas as to whether it pays to keep right uptodate.

Sammy has a competitor in the repair business.

That other shop is an outofdate, tumbledown, rambling affair without a modern tool in it, and is littered from end to end with all sorts of scraps and remnants of former jobs.

An enterprising machine-tool salesman sold Sammy a nice new lathe.

It was made in Cincinnati, and it had all of the modern conveniences for getting out work quickly and accurately. As a small part of the payment he took away the oldest and poorest lathe that Sammy had. It surprised and amused Sammy to find that his competitor had bought the "remains," as Sammy termed the old lathe, and had set it up and put it to work.

As time went on Sammy was continually surprised but not nearly so much amused to find that the other shop was getting more of the repair work than he was. He could not understand it.

A man who had worked for Sammy was foreman of the other shop. One day this man came to Sammy and asked him if he had any more old lathes that he wanted to get rid of. He said business was so good that he needed another one.

"Why don't you get a good new lathe instead of loading up on worn out stuff?" Sammy asked.

"If is it a fair question, what do you charge an hour for repair work?" Was the reply.

"It ranges from a dollar an hour for the boring mill and a first-class machinist down to 20 cents an hour for a boy on one of the small drill presses. Lathe work usually ranges between 50 and 75 cents an hour according to the size of the lathe and the kind of a man that it takes to do the job."

"We do it differently down at our place. We charge 40 cents an hour straight no matter which machine is used or who does the job." "But see here! You can't afford," broke in Sammy, but did not get any farther for the other man was not through explaining. "You hold on a minute and listen. Our machines are not worth much but we have a lot of them." "Yes, and you could do as much work with one-fourth as many if they were first class," muttered Sammy.

"If a man comes in in a hurry with a job I always have a machine to put it in. Some of the laborers can do a little plain machine work. Enough anyhow to make a show in a pinch. If I were manufacturing things it would be different but you see I am not. A job of repair work is a very indefinite

thing. No two of them are just alike so that there cannot be a set price and yet there must be some way to get at the price to charge and it must be some way that the other fellow can understand. He can understand 40 cents an hour. Sometimes a suspicious sort of fellow will hang around and watch all the time that a job is being done to see that the right number of hours are charged. Most of them don't think as much of the total as they do of the rate per hour."

"Do you think," asked Sammy, "that you can do work with your machinery and your rates so that it costs the customer less than it would if we did it with our machinery at our rates?"

The other man laughed. "It is not us that count here. It is the fellow who wants the work done. A machine is a machine and it takes someone to run a machine. Lots and lots of people will take their work where they can get the—no, they will go where they can get a—machine and a man to run it at the lowest rate. And really now, there are lots of jobs, rough jobs you know, where there is not much difference between the time a good man and a poor man takes. One may do a nicer job than the other but likely the customer wouldn't know the difference even if he did see it."

Sammy thinks that he has partially solved the problem of why machine tools do not oftener get into the scrap pile.

He has a nice lot of customers who know a lot about machine-shop work but for all that his competitor is busier than he is on the repair end of the business.

Even with customers who think that they are better served in a shop that is equipped with modern tools things can happen that are not expected or agreeable.

An Experimental Gas Engine

One day a man came in. He had an alert, business air and a roll of blueprints. He was looking for a place where they were equipped to do good work. After looking around the shop and hearing the scale of prices he seemed satisfied. He said that he had served time as a machinist and that he knew the importance of a well arranged shop and good tools; then he opened up his roll of blueprints. They showed a new design of gas engine. Several views of the assembled engine were shown so arranged as to give a clear idea of the arrangement of the parts.

These views were not dimensioned, except for some over all sizes. The parts in detail were shown on separate sheets, each part being drawn to a suitable scale and fully dimensioned. There were also sheets of bolts, screws, studs, nuts and other material which would be needed.

The blueprints had the appearance of having been the work of an expert.

This man wanted the entire work done, Patterns, castings, machine work and testing. He said that he recognized that on such work it would be hard to tell the exact cost as some things might have to be changed because of things which the testing might bring up but he would like to get an approximate estimate as to the cost, not to be used as a basis of settlement but for the information of the gentlemen who were in with him and who expected to pay the bills.

The engine was a small one and did not seem to have any "freak" features. Sammy thought he could make the patterns and build one engine for something under a thousand dollars. Wishing to be on the safe side he said: "The first engine of any kind is somewhat of an uncertain quantity. The cost might run up to $1500 and if you have to change the general design there is no telling where it might go."

The man was satisfied and told him to go ahead, and to crowd the work as fast as it could be done. To help matters along he intended to stay around most of the time.

Several patternmakers were started; forgings were made, and the machine shop started on such parts as could be made from standard stock. As soon as a pattern was finished it was put into the foundry and from there into the machine shop.

One day a machinist who was working on the job, and who was interested in gas engines in a general way from having worked in a gas-engine shop, while he had a "loafing cut" going began trying to figure out how this gas engine was intended to work. He had nothing but the detail drawings to go by and was amusing himself combining them when he noticed that some of his sizes did not seem to come right. He stopped his machine and went over to another fellow who was also working on the job and wanted him to go over it. This man refused to do it. He "guessed" that the people who made the drawings understood their business, and it wasn't any of his business anyhow. His business was to do the work acording to the blueprints furnished to him, and he was doing it.

This did not satisfy the mind of the first man so he hunted up Sammy and Sammy told him to keep on with the work. Then Sammy went to the man who was having the work done and told him that one of the men thought some of the parts did not check up for size. He thought it was a scare about nothing but went and talked with the machinist and then changed several sizes on some of the blueprints and said that everything would be all right. Soon afterward it was found that changing the sizes would make it necessary to change quite a number of others until it could not be foreseen where the changes would end or what effect they might have on the design. The work was stopped until the matter could be straightened out. The customer and the draftsman started in to check up the drawings.

The customer took charge of this work and the draftsman did the combining of sizes. When everything was gone over it was found that some patterns had to be changed and a lot of machine-shop work thrown away. The man who began putting the engine together discovered that while some parts went together all right in one position yet they would not have room to follow through their cycle of movements and clear all other parts.

Work was again stopped and the draftsman was set at the work of diagramming all moving parts, following them through their movements. This work showed up a lot of trouble that made more changes necessary.

About the time that every man working on the job had gotten so that he hated the sight of it that gas engine was in shape to be started. It had all of the pieces that the drawings called for and they would all work without interfering with any other pieces in an improper manner.

The gas connection was made and the engine pulled around but it failed to start. Different adjustments of gas and air were made and different men put on to pull it around. Still it wouldn't start. After several days of such work the theoretical aspect of the engine was investigated and the inventor saw several little things which he thought needed changing.

After that a few more things were changed, then the man who had worked in a gas-engine shop made a few suggestions and some more alterations were in order. Finally the engine consented to run in a way but the way did not satisfy anyone. It had a way of starting off and running "like a house afire" as one fellow expressed it, and then it would stop and have to be coaxed and petted a lot before it would condescend to start again.

More changes were made and when the engine was in shape so that it could be started readily and would keep going testing began. The power was not up to expectations neither was the economy. To get them where they would be desirable more changes were made. After a time an engine was produced that was almost as good as some of the engines already on the market.

No, I am not going to tell you what that engine finally cost. I will say that the cost exceeded all expectations, but it was the only thing about the engine that did.

Sammy has been paid for most of the work and expects to get the balance before the engine is taken away but for all of that he is sorry that he did the work. The customer thinks that it cost a lot more than it should have done and

places at least part of the blame on the shop. Sammy does not mind that very much but he cannot make the business men who were back of it understand the matter. Perhaps the inventor is not helping him much. He rather thinks that if those business men have some work which they are interested in paying for they might have it taken to the shop where they charge 40 cents an hour straight and see whether the results would be more satisfactory.

Tools and Dies for Drop Forging

By E. F. Lake

Dies, and the forgings made in them, that illustrate the variety of work done. The examples include a steel propeller wheel, a large and a small piece and a bronze forging.

A new drop-forge hammer with its strength of uprights and method of computing the same. Adjusting mechanisms as well as board clamping device also of new design. The trimming press that goes with the hammer.

Some radical changes have been made in the design of the new drop-forge press brought out by the E. W. Bliss Company, of Brooklyn, N. Y., based on the experience gained in their own drop-forge shop. The new features are designed to reduce both wear and breakage.

This company operates a drop-forge shop of considerable size, the style, size and shape of drop forgings they make being quite numerous, so that the hammers receive severe tests on a wide range of work. To illustrate some tests to which the hammers are put, it will be well to give a few samples of the forgings that they make and the dies in which they are made.

Propeller Wheels

In the left of Fig. 1 are shown the two halves of the die that forges the propeller wheel used in the submarine torpedoes made by the E. W. Bliss Company. These propeller wheels are made of drop-forged steel, owing to the great strength that is required of it to push the torpedoes through the water at the rate of 28 knots per hour.

In making these, round blocks of steel are cut up like that shown at *A* in the upper left-hand corner. This block is drawn out by the hammer man on a steam hammer to the shape shown at *B*. On one of the blades, as at *C*, an end is drawn out to serve as a handle when drop forging it. After this operation the piece is taken to the drop-forge press, where it is hammered into the two half dies shown below. It then assumes the shape shown at *D*.

Owing to the difficulty of making trimming dies and the number of propeller wheels wanted not warranting the expense, the flash is trimmed off by hand. This leaves it as shown at *E*, after which it is taken to the machine shop and made absolutely smooth and true to size by machining with profile cutters.

Odd Shaped and Large Forging

In the right-hand half of the picture is shown an odd-shaped piece that requires an irregular parting line on the forging dies. At *F* is shown the lower die used in forging this piece, and at *G* the upper half, which is fastened in the drop hammer of the press. A plain bar is used to forge this piece from, and it is first broken down between *H* and *I* of the two halves of the die. After this it is hammered into shape and leaves the die as shown at *J*. It is next taken to the trimming die, where the flash is trimmed. The lower half of this trimming die is shown at *K*, and the upper part at *L*. After going through this the piece is ready for the machine shop and in the shape shown at *M*.

One of the largest pieces that the company drop forges is shown in Fig. 2. This is made in several sizes, the largest of which is something like 24 inches in length. The bar is first broken down between *N* and *O* of the forging dies where it is changed into the shape shown at *P*. After this it is drop forged in the dies shown and leaves them in the condition shown at *Q*. The final operation is to trim it in the dies shown at *R* and *S*, and these leave it in the shape shown at

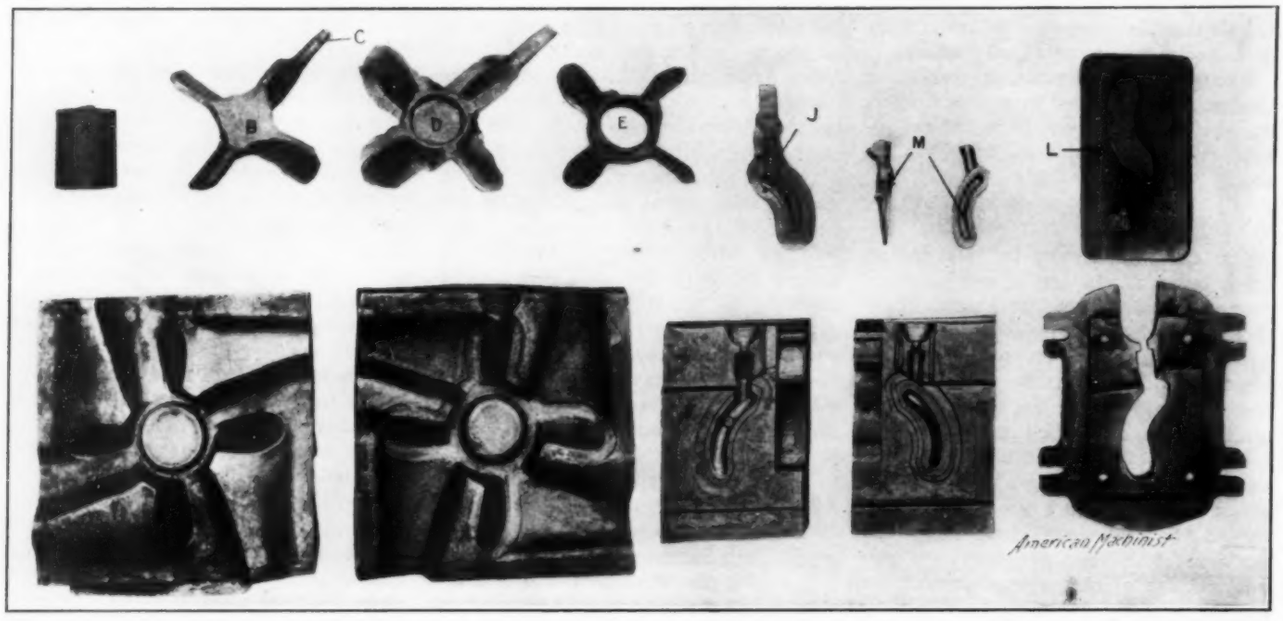


Fig. 1. Drop Forging of Propeller Wheel and Another Smaller Disk

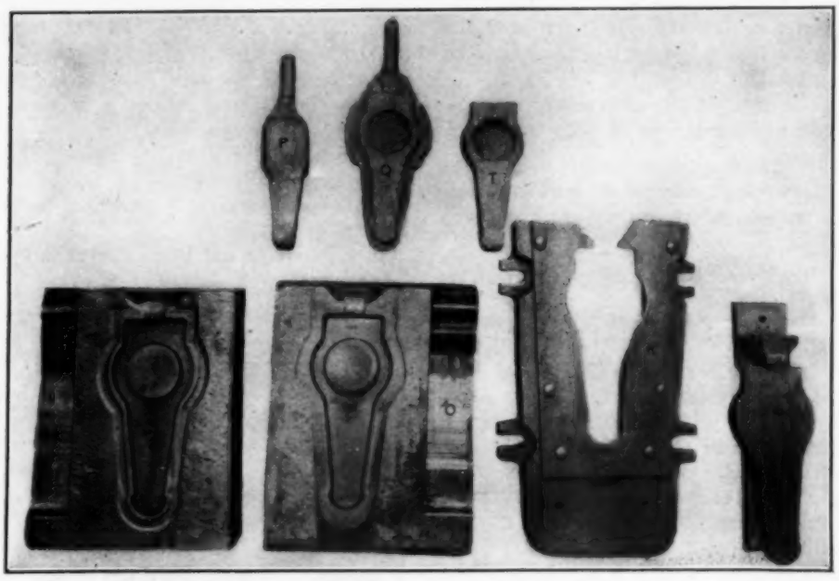


FIG. 2. DROP FORGING AND TRIMMING DIES AND THE FORGING OF A GOOD-SIZED PIECE

T, where it is ready for the machine shop.

BRONZE FORGING

That bronze can be drop forged as easily as steel is shown by the piece in Fig. 3, with the dies that are used. This piece, like the steel forgings, is broken down from the solid bar between *U* and *V* of the forging dies, and afterward formed into shape between these. It leaves them in the state shown at *W*. After this the flash is trimmed off with the dies *X* and *Y*, and this leaves the forging in the shape shown at *Z*, which is ready for machining.

NEW DROP FORGE PRESS

The new press that has been made for use on this class of work, is shown in Fig. 4. The side frame has been given a new shape; a new mechanism has been devised for adjusting it to position at the bottom; the method of fastening the drop to the board has been changed, and the parts used for taking up wear have been altered in design.

The operating mechanism of the hammer is shown in Fig. 6. The wear on roll *A*, which in combination with roll *B* grips the board to lift the hammer, is taken up by pulling lever *D* out of its holder and turning the screw *E* enough to give the roll its necessary tightness. After this lever *D* is put back in its

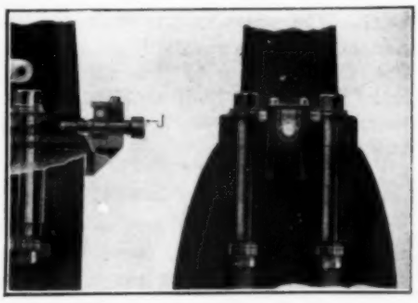


FIG. 5. METHOD OF ADJUSTING SIDE FRAME

holder to prevent screw *E* from jarring loose. Screw *F* is operated in the same manner as screw *E*.

The method of fastening the board in the drop has been changed so that it is no longer necessary to take a 2½-inch plank and plane the greater part of its length down to 1½ inches in thickness, in order to get a bevel on one end that was only 2 inches long. With this new method a straight plank is used and a tapered steel piece with saw teeth on one side, as shown at *G*, is slipped into the dovetail of the drop, along with the lifting board. On the opposite side of the board wedge *H* is dropped into place and wedge *I* driven in tight. This causes the saw teeth on piece *G* to grip the board and hold the drop firmly as long as wedge *I* remains tight.

In Fig. 5 is shown the method of adjusting the side frame. By backing out the set screw *J* and removing the two bolts *K*, the entire adjusting mechanism can be removed for replacement or repair. Its method of moving the side frame forward and back can be plainly seen from the illustration.

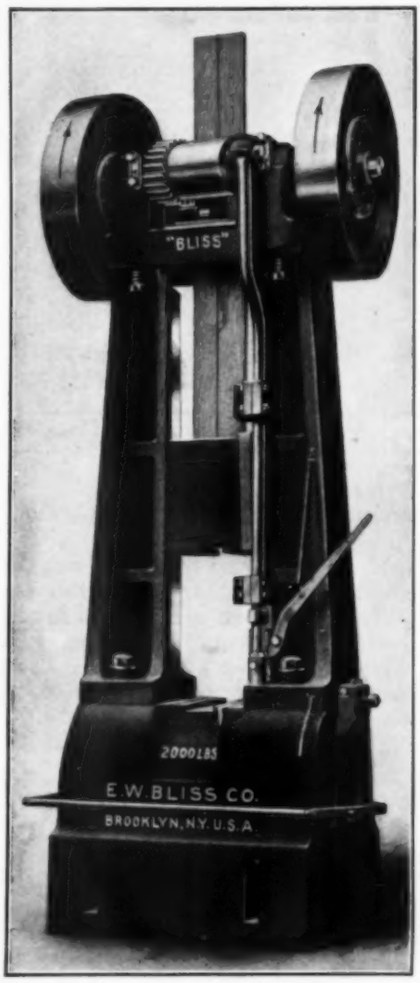


FIG. 4. NEW DROP-FORGE PRESS

STRENGTH OF SIDE FRAMES

In Fig. 7 is shown the alteration in the sectional design of the side frame, and the greater strength that has been obtained thereby. The strains that are set up in these side frames by the dropping of the hammer, as well as the method of computing their strength, are also shown.

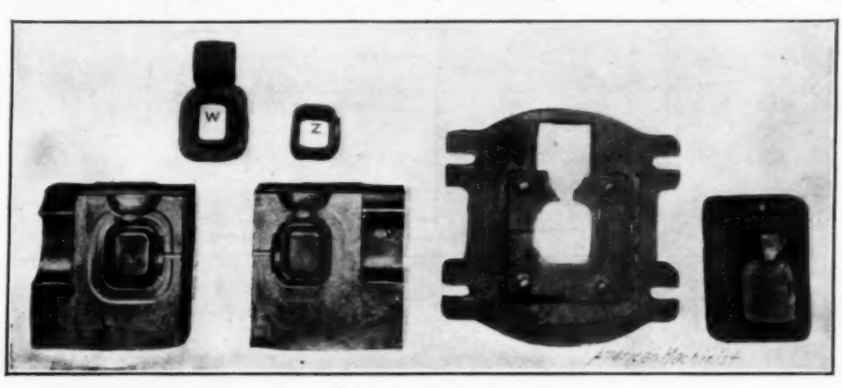


FIG. 3. DIES FOR DROP FORGING THE BRONZE PIECE SHOWN

When the drop falls in an absolutely perpendicular line and strikes exactly central no strains are transmitted to the side frames, or uprights, of the press. This, however, seldom occurs in actual working conditions and therefore it is necessary to have side frames of considerable strength.

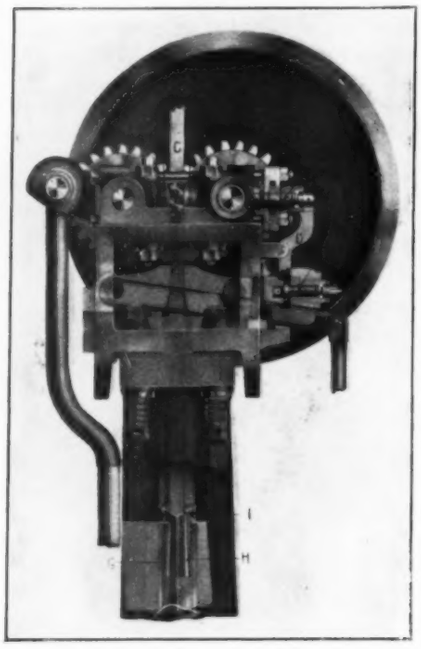


FIG. 6. MECHANISM FOR LIFTING THE HAMMER

If a 1000-pound hammer, such as shown, drops 30 inches and strikes 4¼ inches away from the center, and is brought to rest by performing work through a distance of 1/32 of an inch, then a mean force of 158,000 pounds is exerted against the side frame at *B* during the time in which the hammer is being brought to rest.

The method of computing the mean force exerted against the side frame is as follows:

Mean force exerted on work in dies

$$= \frac{1000\ lb. \times 30''}{\frac{1}{32}''} = 960{,}000\ pounds.$$

Mean force sustained by side frame

$$= \frac{960{,}000\ lb. \times 4\frac{1}{4}''}{25\frac{3}{4}''} = 158{,}000\ pounds.$$

In the old style of drop-forge hammer built by the Bliss Company the side frame was given a sectional shape like that shown at *C* in Fig. 7. In this type the virtual stress area to resist pressure delivered at *B*, is shown by the sectional lines in *D*. Its ultimate B.M.R. = 18.34 × 18,000 × 10¼ = 3,380,000. And in it *Z* = 18.34 × 10¼ = 188, and *I* = 188 × 7¼ = 1362.

An ordinary section for drop-forge hammers is shown by *E*. The section of this that will resist the impact is shown at *F*. In it *Z* = 27.52 × 10⅜ = 286, and *I* = 286 × 7⅜ = 2110. The ultimate B.M.R. = 27.52 × 18,000 × 10⅜ = 5,130,000.

A sectional view of the side frame used in the new Bliss drop hammer is shown at *G*. The stress area to resist the impact of the hammer blow is shown by *H*. For this frame *Z* = 43.07 × 12¼ = 528, and *I* = 528 × 6 13/16 = 3595. The ultimate B. M. R. = 43.07 × 18,000 × 12¼ = 9,500,000.

COMPARISONS OF STRENGTH

In comparing these it will be seen that the old Bliss section *C* is exceeded in transverse resistance by the later type, of ordinary section *E*, as 3,380,000 is to 5,130,000 respectively, or 1.52 times. On the other hand the new Bliss section *G* exceeds the ordinary section *E* in transverse resistance as 9,500,000 is to 5,130,000 respectively, or 1.85 times. This makes the new Bliss section *C* exceed the old Bliss section *G* as 9,500,000 is to 3,380,000 or 2.81 times.

In rigidity the old Bliss section is exceeded by the later or ordinary section *E* as 1362 is to 2110 respectively, or 1.55 times. The new Bliss section *G* exceeds the ordinary section *E* as 3595 is to 2110 respectively, or 1.70 times. This makes the new Bliss section *C* exceed the old Bliss section *G* in rigidity as 3595 is to 1362 or 2.64 times.

With regard to the value of rigidity, it

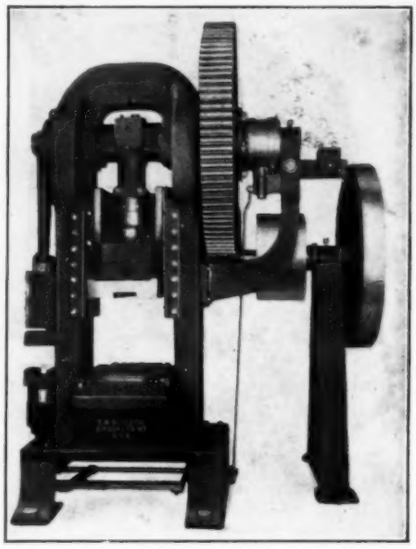


FIG. 9. THE NEW TRIMMING PRESS

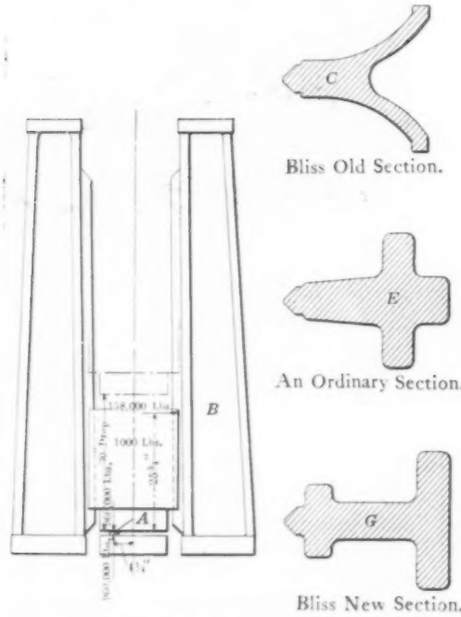


FIG. 7. TYPES OF SIDE FRAMES AND THEIR RELATIVE STRENGTH

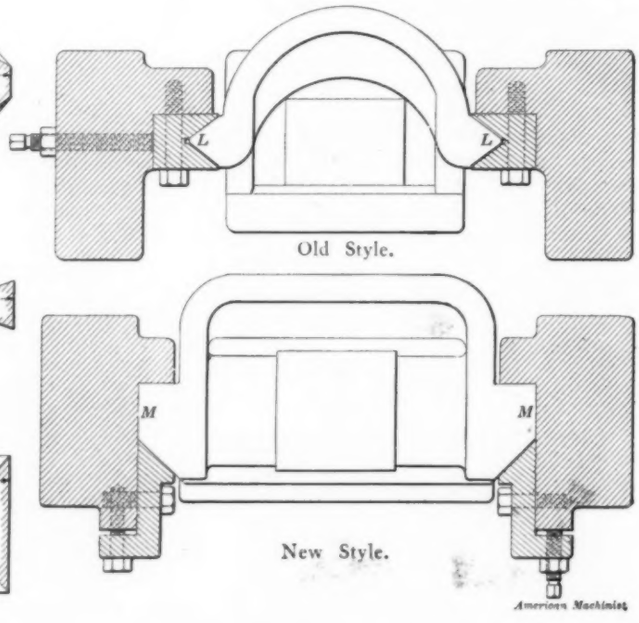


FIG. 8. OLD AND NEW STYLE OF TRIMMING-PRESS FRAMES

is worth mentioning that a hammer frame absorbs energy when under side pressure equal to the pressure times the distance deflected, and that the energy so absorbed is an appreciable loss. The most rigid frame is, therefore, the most efficient for avoiding this kind of loss and for obtaining the maximum of useful work from the hammer blows.

From the above it will be seen that much greater strength and rigidity have been obtained in the uprights or side frames of the new drop-forge hammer. This, with the other alterations in design, doubtless make it one of the strongest, easiest adjusted, and most rigid hammers for the making of drop forgings.

Trimming Press

The new trimming press that goes with the drop hammer is shown in Fig. 9. This has not had such radical changes as the drop hammer, but it has been altered in numerous places where better design would give better results. The most notable change is in the form of the guides and the method of connecting the slide to the crank shaft.

The old and new style of guides are shown in Fig. 8. The V-shaped blocks, as shown at *L*, that were used in the old style of press, with their clamping and adjusting screws are shown in the upper view. The style adopted for the new trimming press is shown in the lower view at *M*. This consists of right-angle bearing, on one side of the slide, and a bevel bearing on the other side, to hold the slide in place and take up the wear. This bevel bearing is held in place by clamping and set screws as shown.

This design gives nearly twice the wearing surface of the V-blocks used in the old design, and is as simple to machine. This line cut plainly shows the way the holding piece is put in; that no more bolts are required to hold it in place or make the necessary adjustments, and that a greatly increased bearing surface is obtained. It is therefore apparent that a very simple alteration accomplishes important results.

Tool for Machining Bearing Seats

By H. B. McDermid

Special tool that is used in conjunction with a portable planer, on a floor plate, to machine the curved seat in a engine frame for the lower shell of the main bearing.

When a new design of bearing seats, to support the shell of an engine main bearing, came down to the shop, it was up to the foremen of the tool room to design and build a tool that would rapidly and economically machine its surfaces.

The quarter boxes of the bearing were supported from the jaws of the frame by means of the usual type of adjusting wedges; but the bottom shell rested on a surface of the frame that in the direction parallel to the axis of the shaft, was the arc of a circle varying from 8 to 12 feet in diameter, according to the size of the frame. In a direction crosswise of the shaft's axis, the surface was horizontal. A segment of a ring of the above inside diameters, if rectangular in cross-section, would have, for its inside surface, one identical with that used as the bottom surface of this jaw, assuming its center line to be placed in a vertical plane passing through the axis of the shaft.

As, for above reasons, it was entirely impractical to bore this jaw in a lathe, and the sides of the jaw were to be machined by a special shaper of the floor-plate type, the scheme shown in the accompanying halftone was adopted. It had a decided advantage in that all surfaces are machined by the same machine and its attachments, at one setting of the frame, rendering possible a very good alinement of all parts.

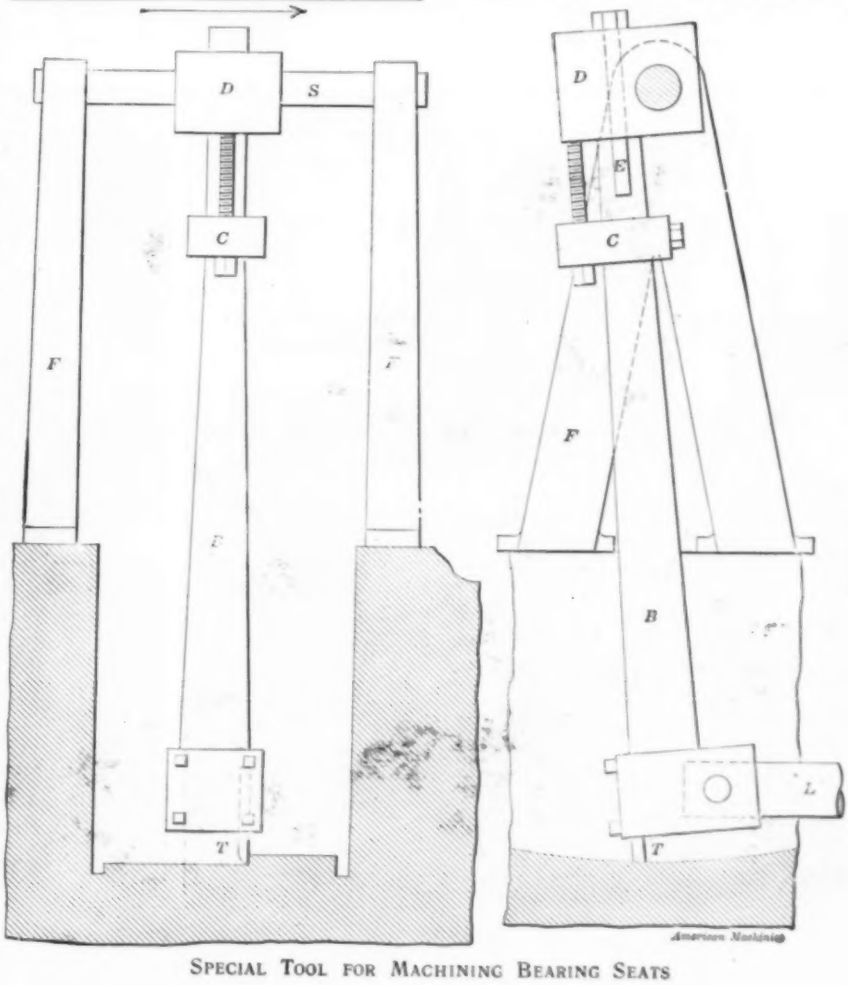
The engine frame and shaper are set up and rigidly bolted to the same floor plate, and the attachment shown is mounted on top of the jaw and held by the bolts which ultimately hold the bearing cap in place.

The side frame *F* carries the shaft *S* upon which slides the block *D*. This in turn supports the bar *B*, which carries at its lower end the tool *T*, as shown.

An adjusting screw working through the block *C*, which is solidly attached to the bar, provides a handy method of tool adjustment. A heavy link *L* attached to the ram of the shaper provides the motive power. A keyway *E* and key prevent any rotating motion of the bar about its axis.

The feed for the tool is obtained by feeding the special shaper along horizontally on its bed plate, the motion being transmitted by the heavy link *L*, thus forcing the block *D* to slide along its pivot in the direction shown by the arrow.

The device does its work very well indeed, and is a good example of an efficient tool performing easily what would ordinarily be an awkward operation.



Special Tool for Machining Bearing Seats

Some Work Done on the Fay Automatic

Editorial Correspondence

The following examples of work done on the Fay automatic lathe built by the Fay Machine Tool Company, Philadelphia, should prove interesting. Fig. 1 shows the making of cast-iron piston rings. The "pots" are gripped in the 3-jaw chuck as shown and simultaneously bored (concentric with the cutting-off tools), turned eccentric on the outside and cut off by the multiple cutting-off tools, finishing 11 rings at a clip.

The shaft *A* at the back is geared to run at the same speed as the spindle and carries a cam or eccentric which moves the turning tool in and out to give the eccentricity to the ring.

The cutting-off tools are so arranged that the finished rings drop off one at a time. By this method from 55 to 60 rings an hour are finished. The "pots" are 4⅝ inches outside and 3⅞ inches inside diameter by 6⅝ inches long. The finished rings are 4.485 inches outside and 4.089 inches inside diameter by 5/16-inch face. They are turned 1/32 inch eccentric. Fig. 2 shows the pulley, while being turned. The tools in the carriage turn the face, square the edge of the rim and the top of the flange. The back tools, two in number, square the sides of the flanges. Fig. 3 is a line cut of a pulley turned at the rate of 3 per hour.

Fig. 4 shows an automobile casing of malleable iron. Fig. 5 is a 3½ per cent. nickel-steel automobile bevel gear.

Fig. 6 shows the casing, shown in Fig. 4, in the Fay lathe for the first operation. The three tools in the carriage turn the three different diameters while the five tools at the back square five of the faces. The work is held, as shown, in a chuck and the production is 100 pieces per day per lathe. Fig. 7 shows the second operation on the casing. The tools in the carriage again turn three diameters while the back tools square four faces. In this operation the work is held between centers and the production is 55 pieces per lathe per day.

Fig. 8 shows the first operation on the gear shown in Fig. 5. The carriage rough bores and then finish bores the hole. It then rocks over and squares up the in-

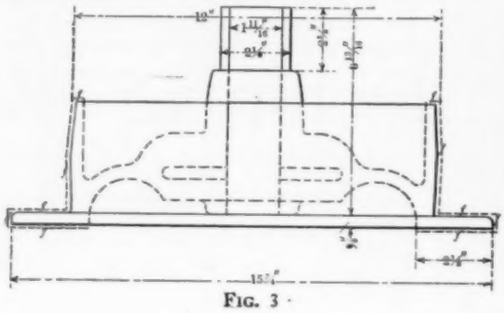


FIG. 3

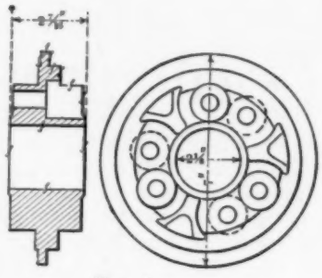


FIG. 4

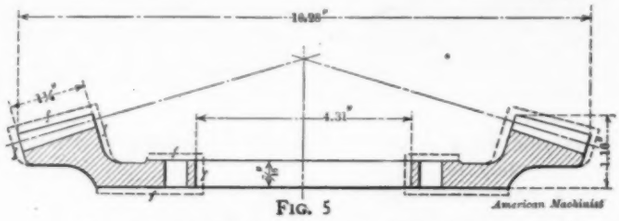


FIG. 5

SAMPLES OF WORK DONE ON THE FAY AUTOMATIC

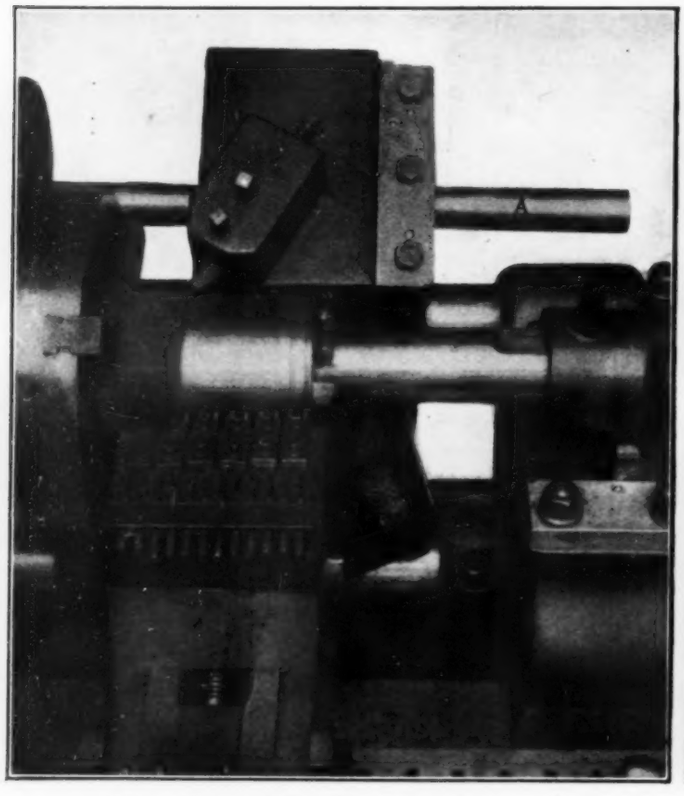


FIG. 1. MAKING CAST-IRON PISTON RINGS

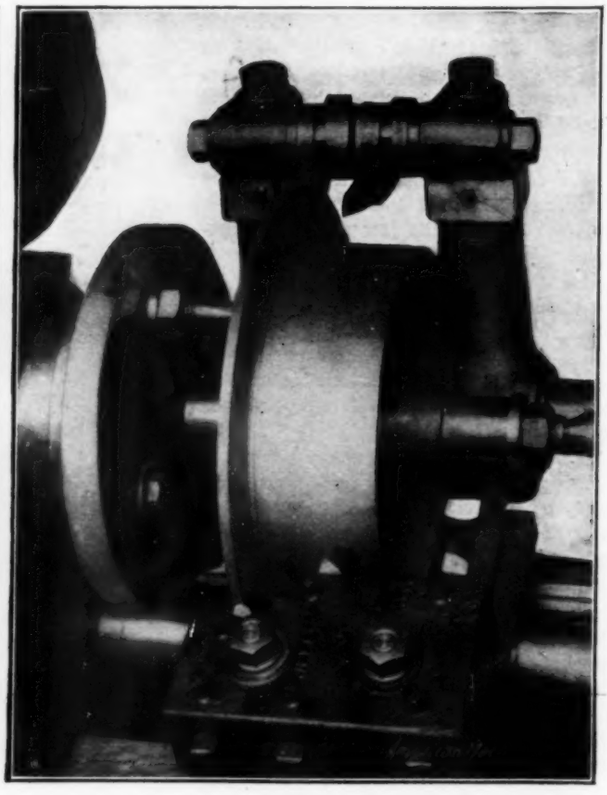


FIG. 2. TURNING A FLANGED PULLEY ON THE FAY AUTOMATIC

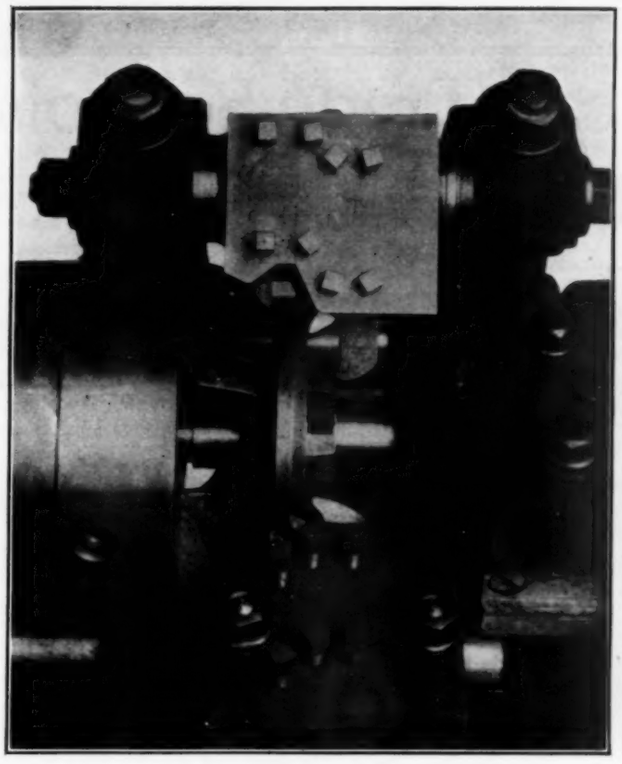


FIG. 6. FIRST OPERATION ON AUTOMOBILE CASING

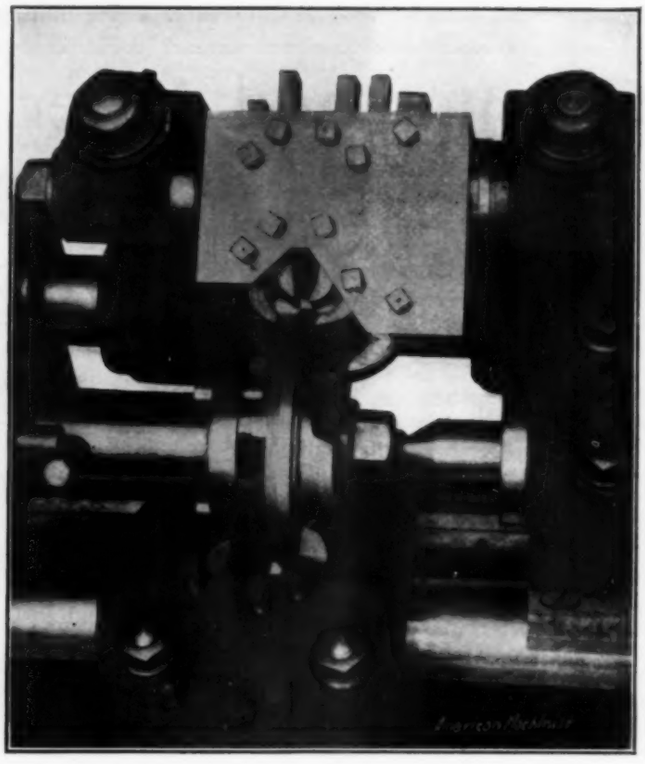


FIG. 7. SECOND OPERATION ON AUTOMOBILE CASING

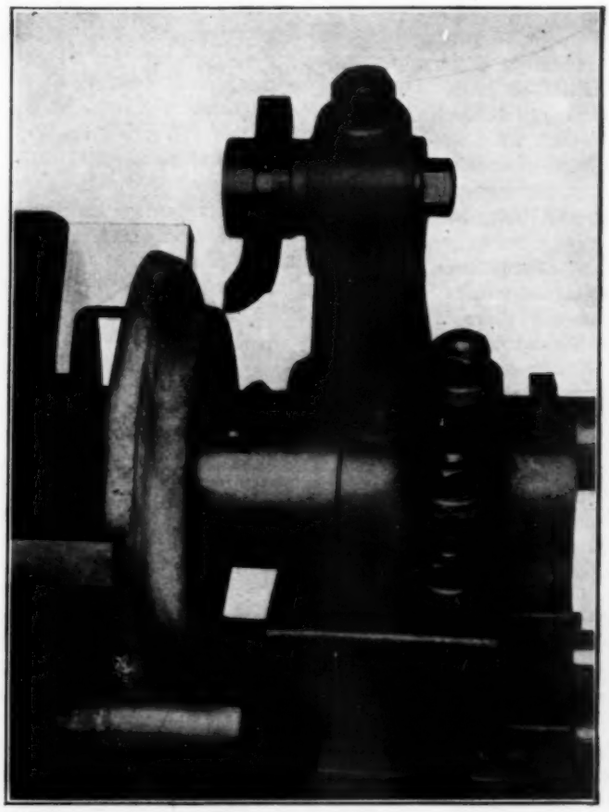


FIG. 8. FIRST OPERATION ON NICKEL-STEEL BEVEL GEAR

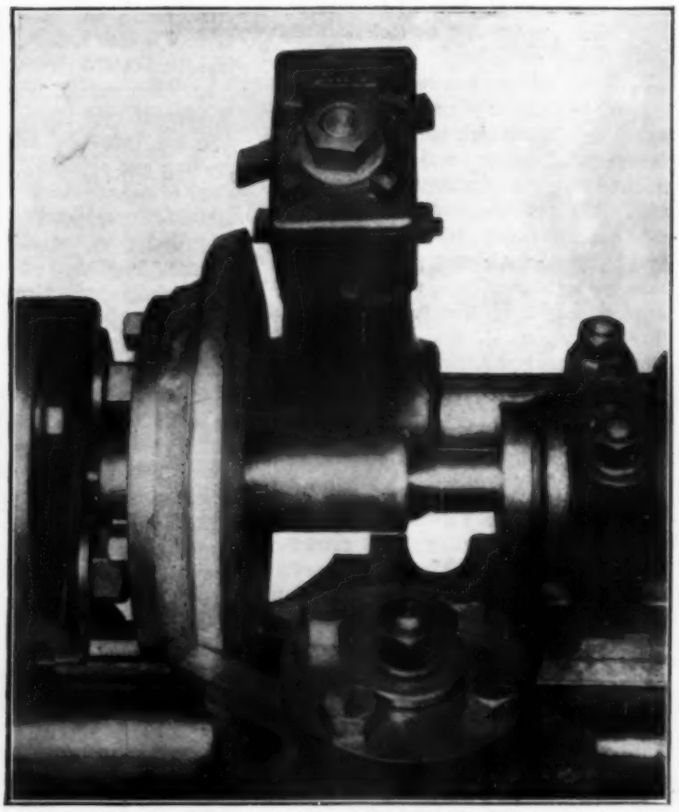


FIG. 9. SECOND OPERATION ON NICKEL-STEEL BEVEL GEAR

side face. The back tool squares the face. The work is held as shown in the chuck and the production is 60 pieces per lathe per day.

Fig. 9 shows the second operation on the gear. In this operation the work is held between centers. The tools in the carriage face the ends of the teeth, the back tool rough turns and finish turns the face. The production is 90 pieces per lathe per day, which it will be noted is a good record.

German and American Trade Schools

By Paul Kreuzpointner*

Another man who knows confirms our account of the so called German trade schools. He also points out the reasons for the success of the German system and gives American manufacturers some wholesome advice.

*Chairman, Committee on Industrial Education, American Foundrymen's Association.

The editor of the AMERICAN MACHINIST is to be congratulated upon his lucid and correct interpretation of the character and scope of the misnamed German trade schools—misnamed, because of our tendency to apply our American conception of a trade school to the results of the mechanical skill of the German workman, a skill supposedly acquired in the Gewerbliche Fortbildungsschule (industrial continuation school or industrial improvement school), but in reality the product of the still largely prevailing apprenticeship system, supplemented and emphasized by the intellectual and technical work of the compulsory improvement schools. Because so much is said about these improvement schools and their compulsory feature and nothing about the time spent in the commercial shops, the impression has gone forth that it is in the schools that the German workman acquires his mechanical skill.

THE NEW SCHOOL SYSTEM OF MUNICH

It is the radical change from the old style intellectual improvement school to the intellectual-technical school shop, where the boy finds himself the center of vocational activity and its technical character and intellectual broadening and deepening, due to the reorganizing genius of Dr. Georg Kerschensteiner, that has made the Munich industrial improvement schools famous and the center of attraction for the educators and industrial men of every civilized country. It is this departure from the old, traditional, purely intellectual improvement school to the intellectual school shop which has caused England, Switzerland, Austria, Sweden and the United States to invite Doctor Kerschensteiner to come to these countries and explain to them the underlying principles of this happy combination of intellectual-technical school-shop work.

A study of the laws governing the establishment of the German improvement schools will show that shop instruction was not contemplated and its provision was not necessary in the schools, because the boys enter commercial shops immediately on leaving the common schools. In other words there is, in Germany, no problem of lost years to be provided for by the schools as with us.

At Munich, Bavaria, industrial improvement schools have existed since 1803. During the middle of the last century they had attained a high degree of efficiency, as I can testify, having been a student of these schools from 1856 to 1861. But the progress of the industries demanded still greater efficiency, and the city passed laws in 1871, 1875, 1876, 1878, 1892, 1893 and 1894, and in 1895 Doctor Kerschensteiner began the reorganization of the whole Munich system of industrial schools.

NEW ILLUSTRATIONS OF THE WORK OF GERMAN SCHOOLS

The Kingdom of Würtemberg has a very effective system of improvement schools, there being one such school for every 15,500 inhabitants. The curriculum of these schools includes: Industrial arithmetic, commercial arithmetic, geometry, descriptive geometry, drawing, freehand drawing, modeling and woodcarving, engraving and chiseling, physics, chemistry, engineering, business forms, penmanship and orthography, stenography, industrial and commercial bookkeeping, exchange, French, English, Italian, economic subjects, geography, history, German literature, hygiene. As will be seen there is no shop work provided in the whole curriculum.

In Prussia we find laws establishing industrial improvement schools, and providing for a minimum of four hours per week of instruction. The work includes reading on moral, industrial, scientific, historical and geographical subjects, fundamental laws and social economic subjects. Attention is also given to business law and usages, rules and regulations of the postal, telegraph, telephone and railroad systems, composition in connection with caligraphic and orthographic exercises, arithmetic and bookkeeping.

It will be seen that the law does not contemplate nor prescribe shop work, the simple reason being that the boys are supposed to be engaged in some form of apprenticeship and practical shop work and therefore the improvement school is only intended to supplement the commercial shop activity and to continue the cultural work of the public school. Not even the lower and middle technical schools have shop work. These are schools of a technical character, are higher than the improvement schools, but are not preparatory schools for engineering.

But while this is the law, a municipality can add to this program and hence we sometimes find a difference in the application of the law in different communities. There is nothing to hinder a community from putting shops into improvement schools, as was done in Munich, if the city council is willing to pay the additional expense.

GERMAN AND AMERICAN CONDITIONS CONTRASTED

The educational situation and social conditions being so radically different in the United States and Germany, it may be readily perceived that we have no reason to be enthusiastic over the German system of industrial schools, as applied to our conditions, notwithstanding the excellence of that system. The German trade-school problem is greatly simplified by the boys entering vocational life at 14, precisely the age when we are confronted with the serious problem of the lost two years. There is relentless compulsion, coöperative spirit, willingness to make sacrifices. Here we have laxity, indecision, unwillingness to make sacrifices. There the citizens have confidence in the schools and teachers and if the business interests desire a change or correction they have to go to the Minister of Education and await his deliberate action. Here there is constant, irritating fault finding with the schools and teachers. The teachers are made responsible for conditions which were beyond their power of creation and which are the result of economic forces and not chargeable to the schools. The teachers are held responsible for the effects upon the schools of corrupt politics, of social or commercial influences, which frequently convert the school into a bargain counter for the exchange of political and social favors by the appointment or retention of incompetent teachers, or turn the schools into asylums for the support of the daughters of taxpayers who reason that, because they pay taxes, the community is under obligations to return these taxes to them under the guise of salaries to their children.

There the industries and business in-

terests coöperate with the school authorities. Here the same interests stand aloof, do not, with rare exceptions, interest themselves in the conditions of the schools and the causes which tend to make them good, bad or indifferent, but try to unload the exacting burden and responsibility for satisfactory results upon the schools and teachers without helping to remove obstacles, to strengthen where there are weak spots, to encourage where there is timidity, to remedy abuses where there are any, to protect the good teacher and superintendent from the interference of political and social influences, or seeing that public opinion votes money enough to bring the school plant up to the highest degree of efficiency.

Manufacturers Must Cooperate

The public is not yet, and will not be ready for a long time to come, to vote the large sums of money industrial schools will require, and it is up to the interests and to the parents of the children who are to be benefited, to arouse the public to a realization of the necessity of establishing the desired schools. Arouse the public, produce the necessary funds, show your school boards that the welfare of the community requires the establishment of certain schools, meet the schoolmen with a spirit of confidence, and our industries may rest assured that they will respond heartily and intelligently, if not exactly in the way we think they ought to. The schoolmen are experts in their line, as we are in ours, and if they once understand what is wanted they will produce the goods.

What is wanted in the present education crisis is not accusation, suspicion, misunderstanding, but a sincere spirit of coöperation, good will, confidence in each other's worth and value, an understanding that an immense organization and institution like our educational system cannot be changed and adjusted to new conditions by the turn of the hand. One reason why the German industrial schools are so successful is that all social forces work together in harmony and willingness to make sacrifices. And while we cannot import the industrial schools of Germany, we can imitate this harmony and sacrificing spirit to our great advantage—always provided we are not ruled too much by a spirit of self-sufficiency and self-laudation which, under the ever increasing economic pressure, is liable to become suicidal.

The Part of the Public Schools

One thing is certain, whatever we may do in the line of shop schools and endowed trade schools, or here and there a municipal trade school, all of them are only a drop in a bucket in comparison with what we need, we will have to depend largely upon the public school system for help in one way or another. Even where we succeed in establishing special trade or industrial schools, there is no other way to provide the proper preliminary preparation than in the public schools. Hence, the desirability of studying carefully our educational system with the intelligent assistance of the educators, helping them to strengthen the system where it is weak and to raise the whole system to a higher level.

Trade Training Alone Not Sufficient

To neglect the ethical and esthetic sides of industrial and trade training would mean the eventual brutalization of large masses of industrial workers to the detriment of the peace and welfare of society. To train our industrial workers in nothing but manual dexterity is to dwarf and deaden all human aspirations, all higher ideas and ideals, and bring about a condition of mind which will hinder progress and react injuriously upon society. Until we have been able to prepare the public mind for the necessity of the more expensive trade schools, the cheaper, and in their way, highly valuable continuation schools will do a great deal of good and fill a real want.

I have visited manual-training and trade schools freely and have spoken with teachers who understand the situation and the opinion is universally expressed that not as much is accomplished as there might be if the preparatory training were better. For instance, pupils who enter the manual-training department of the high schools without previous manual training in the grade schools below, are never able to make up the loss in competition with the boy who has had manual training in the grades.

In a recent petition of the Catholic citizens of Altoona, Penn., to the board of education of that city, to admit their children to the manual training classes in the grades, it was particularly pointed out by the attorney representing the petitioners, that the boys going to high school and taking the industrial course, are handicapped and unable to compete successfully for positions in shops with the Protestant boys, who have had the advantage of manual training in the grades. This fact is well known to every manual-training teacher, but the underlying principle of this pedagogic phenomenon is ignored by the manufacturers and others who are anxious to obtain skilled men, and ask for the results of specific trade education from boys who have had no, or at best, only the rudiments of preparatory training.

What they do get or will get under these circumstances is human automata, with no insight into the relation of their work to their surroundings, with no sense of responsibility for their work, for their employer, for their fellow workmen or the community they live in, but only a selfish desire to make all the wages they can in order to satisfy their animal wants and get ugly if they cannot do that, whether there is any valid reason for it or not. If this kind of industrial and trade training is to be the result of our civilization and industrial development, then I am glad I am old and near the end of life, for I do not want to see the destructive and demoralizing results upon society and our industries of such a training of millions of our industrial workers.

Our educational system was built up and organized under entirely different social conditions from those now prevailing. Therefore, it must readjust itself to the new conditions. But the teachers alone cannot do this. They did not create the conditions, it was society that created them and it is up to society, to the people, to the industries, to extend their help, their good will, their coöperation and liberal moral and financial aid to the schools and teachers to readjust the schools so that they can absorb industrial and trade education into the organization. To unload this new educational requirement upon the schools and teachers without this social help is unjust and will result in a miscarriage of effort. It will result in educational waste and waste of the taxpayers' money and the next generation will have to do the work over again.

The National Association of Manufacturers have been making inquiries among their members is regard to the conditions of business, and have issued tables showing in percentages the tone of the replies. In the iron working lines, which presumably include the majority of machine shops, 12 per cent. report no improvement in sales since December, 1909, 17 per cent. a slight improvement, 42 per cent. a fair improvement, and 29 per cent. have had a marked gain in their business.

In the matter of collections 52 per cent. report no improvement, while the remainder only report a slight to fair improvement and no marked improvement is noted by anyone. Concerning the present condition of the industry, 20 per cent. reported poor, 32 per cent. fair, 40 per cent. good and 8 per cent. excellent, while those who ventured to predict concerning the prospects for 1911 are 4 per cent. poor, 50 per cent. fair, 33 per cent. good and 15 per cent. excellent. While opinions of this kind are very apt to be tinged with the personal feeling of the individual at the moment and are more or less influenced by the condition of his digestive organs, it is interesting to note that the great majority look for a fair amount of business and there is nothing which will have more effect on producing this than confidently looking for it.

Notes on Drafting Room Lighting*

By C. E. Clewell †

Experiments with various lighting arrangements for a certain drafting room, ending in the adoption of sixteen 40-watt tungsten lamps per bay, grouped in clusters of four each. This brought about a better illumination than the original, with no increase in current consumption.

*Reprinted by courtesy of the *Electric Journal*.

†Lighting expert, with Westinghouse Electric and Manufacturing Company, Pittsburg, Penn.

Few classes of work call for more active and constant use of the eye than that of the draftsman. The necessity for continual distinction of fine lines and details and the use of finely divided measuring scales and delicate instruments warrants a system of illumination free from all features likely to produce eye fatigue and eye strain, and capable of promoting ease and comfort in such work. The problem is not altogether one of providing light of high intensity. Too much light may be as harmful as insufficient light.

The general requirements for such lighting are:

1—Good and sufficient light for each person.

2—Uniform distribution of light provided by lamps in such numbers and so arranged as to furnish illumination which is satisfactory without regard to the arrangement of tables.

3—An arrangement of lamps that will avoid glare and subsequent eye strain.

4—A system which will furnish illumination on the drawing boards with a minimum of shadow effect when using instruments and ruling devices.

5—An intensity of illumination which will permit the discernment with ease of fine lines and detail, and which will be sufficiently penetrating for tracing work.

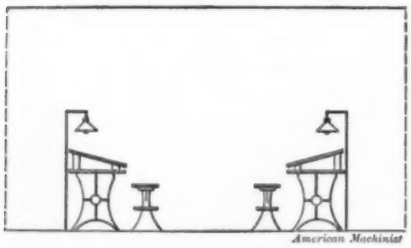


FIG. 1. INDUSTRIAL DESK LIGHTING

EXAMPLES OF UNFORTUNATE ARRANGEMENT

Numerous methods have been used for the lighting of drafting rooms, some of which possess several of the features outlined above, but seldom fulfil all the requirements. For example, one method of drafting-room illumination is that in which one or two light units, provided with reflectors are placed close to the work. This system, shown in Fig. 1, casting an intense light on the paper, is not, however, uniform and it is necessary to change the units when the position of desks is shifted, wiring modifications often being called for in such cases. A system of this kind produces a glare from the surface of certain kinds of paper with subsequent eye fatigue. It should be further noted that the resulting shadows are excessive and this requires a continual shifting of the work or lamps and a consequent delay and annoyance.

In an investigation of drafting-room lighting, tests were made in a typical room with bays 16 by 20 feet and a ceiling hight of 11 feet 6 inches. A sectional view and floor plan of such a bay, together with the lighting arrangement, is shown in Fig. 2. This typical drafting room contained an average of four tables per bay and could accommodate four persons per bay. The room was originally equipped with large light units spaced on an average of from 8 to 10 feet apart and mounted 10 feet above the floor or about 5 feet 6 inches above the drawing boards. The arrangement is equivalent to about three lamps per bay, or 2.5 watts per square foot. The complaints from the use of this lighting scheme were three fold:

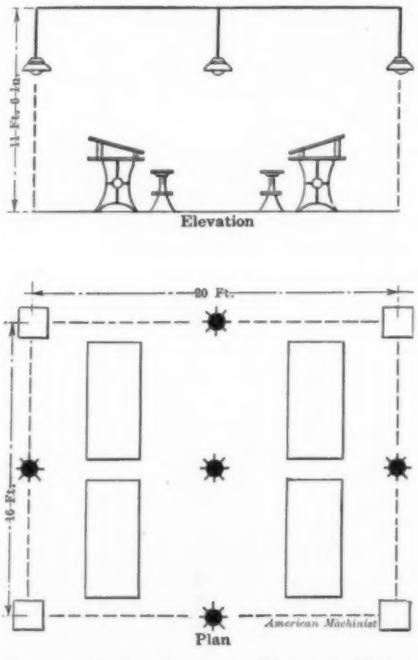


FIG. 2. TYPICAL BAY OF A DRAFTING ROOM LIGHTED WITH LARGE LAMPS

1—The illumination was not uniform, the intensity on some desks being higher than on others.

2—The low mounting hight of the lamps, together with the large size of the units required to furnish sufficient light, caused those working in certain positions to suffer from excessive eye strain, both from the glare of the light source and from the reflected light on the papers.

3—Shadows from the small number of light units were dense and required a constant shifting of the ruling devices so as to receive the light on the work at the proper place.

The problem was to provide illumination possessing all the requirements as outlined above, and with features of such excellence as to be satisfactory in all respects for a class of work which rightfully calls for superior lighting facilities. The study of the requirements will show that uniformity, the absence of shadows and the reduction of glare are the conditions most difficult to obtain. Several methods were given thorough trial before the final scheme was chosen.

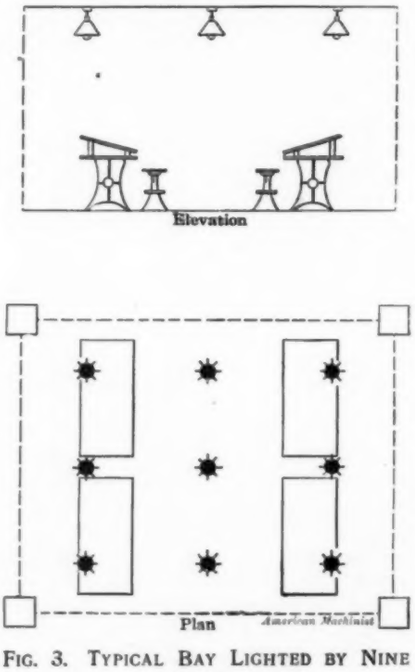


FIG. 3. TYPICAL BAY LIGHTED BY NINE LAMPS

METHODS THAT WERE TRIED

The first step was the installation of 9 units somewhat smaller than those originally used, arranged as indicated in Fig. 3. Certain draftsmen were set to work in this trial bay. From the start the following items were observed: The intensity was excellent, the light uniform, and the glare inappreciable. It soon became apparent, however, that the shad-

ows cast by the large number of units were an objectionable feature. In drawing circles and in the use of the divider generally, some 9 shadows standing out in all directions from the instrument and apparently rotating when a circle was described produced confusion and annoyance. This feature naturally gave rise to considerable complaint and led to the suggestion that the shadows might be diminished by the use of more units arranged in groups for a given floor space. As a second experiment 12 units in four groups were arranged as shown in Fig. 4, the system being made up of four 100-watt and eight 40-watt tungsten lamps per bay. Draftsmen were then placed in this bay so as to work under the light

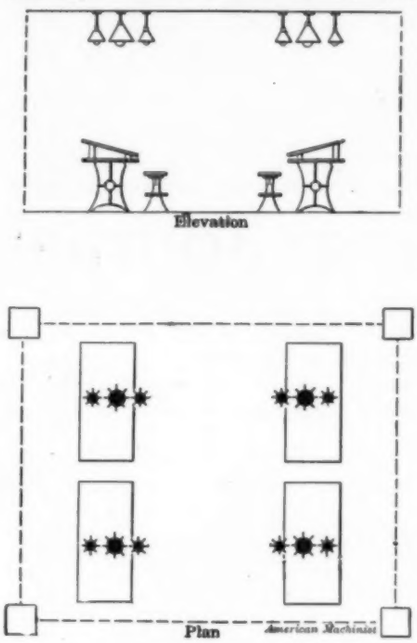


FIG. 4. TYPICAL BAY LIGHTED BY FOUR 100-WATT AND EIGHT 40-WATT LAMPS

for some days. The same trouble was experienced with shadows in excessive numbers as was the case in the first trial, the effect being even more noticeable, due to there being 12 lamps per bay instead of nine, as before. The lack of uniformity was even more noticeable in this scheme, since each cluster can be considered as one light source as far as independence of desk locations is concerned, and the superority of nine versus four light sources or groups per bay was demonstrated.

Other arrangements which were given trial were as follows: One bay was finished as an extreme case with 21 units scattered over the ceiling. Here the shadow effect was perhaps somewhat offset by an excessive intensity, but the use of lamps in such numbers would be prohibitive in point of economy, and even if this were not the case it is questionable whether such large numbers would be admissable from the standpoint of good taste.

An arrangement of four 250-watt tungsten lamps per bay, equipped with broadly distributing reflectors, was tried. While possessing some good points, this arrangements made use of units entirely too large for the ceiling hight. Calculations were made to determine the minimizing of shadow effect in large rooms by the use of broadly distributing reflectors rather than those of a more concentrating type. This involves the building up of intensity at a given point by the light furnished by many distant light sources rather than being entirely dependent upon the light from one overhead unit. A man leaning over his work will cast a deep shadow, cutting off nearly all of the light if provided by one unit overhead and little or none from distant units; whereas if the units are provided with broadly distributing reflectors such shadows will be far less noticeable.

PLAN FINALLY ADOPTED

The plan finally adopted consisted of the use of sixteen 40-watt tungsten lamps per bay arranged in clusters of four each, by mounting the units on fixtures so constructed as to make use of the lamps in an inverted position as shown in Fig. 5. The primary thought in this scheme was the attainment of a light free from the shadows found in previous trials. Various types of reflectors and fixtures as well as the effective mounting hight of the lamps above the floor were successively tried. With the ceiling freshly painted a yellow tint so as to present a coefficient of reflection of about 0.7, the following items were observed: Opaque reflectors which furnished to transmitted light, all of the light coming from ceiling reflection, while providing a shadowless illumination, did not furnish a sufficient intensity for the work in question. The reflectors seemed to give the best results when mounted in a vertical position pointing upward, rather than when mounted in an angular position. Reflectors of a softly diffusing quality of glass and which furnished a considerable amount of transmitted light to the work, seemed to fulfil all the requirements as outlined above. Each draftsman, irrespective of desk or table location, received a good and sufficient light. This light was uniform and was made soft and free from glare by a glass reflector providing excellent diffusion and a soft yellow tint. The shadows were eliminated and with the use of the correct size of lamp an intensity of proper value was provided throughout the room. This system has been in service long enough to show that with the types

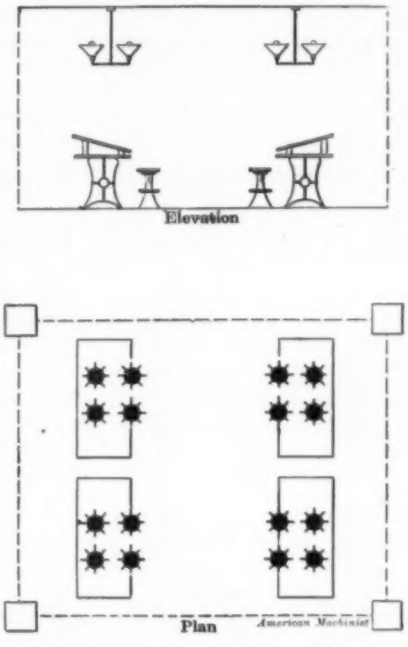


FIG. 5. ARRANGEMENT FINALLY ADOPTED CONSISTING OF SIXTEEN 40-WATT LAMPS

FIG. 6. VIEW OF A DRAFTING ROOM LIGHTED WITH INVERTED TUNGSTEN LAMPS FITTED WITH DIFFUSING REFLECTORS

of units and reflectors available and the limitations of ceiling hight a very satisfactory result was obtained.

It is of interest to note that the wattage per bay with this last scheme was practically the same as that found in the original installation. Hence the superior results were reached by no extravagant installation of larger wattage, but by a carefully arranged plan of the equivalent wattage in another form. The approximate installation expense of the system originally found in use was slightly higher than the new one and the operating expense sensibly the same as that of the system finally chosen.

In such a lighting installation as that just described it is likely that different intensities of the artificial light may be needed at different portions of the day and evening. At first thought the usual conclusion is that more artificial light is required at night than on cloudy days. Experience shows the reverse. During the day the eye is subjected to a stimulus from daylight intensities which are ordinarily many times greater than the intensities of artificial light commonly used. In the daytime this causes the pupil of the eye to be in a contracted state so that it requires a greater intensity on the object than is necessary when the eye is relaxed as at night. Thus on a cloudy day when the daylight is insufficient, a greater intensity of the added artificial light is necessary for producing a satisfactory illumination on the working surface than at night. If the lighting system has been designed for an intensity suitable when used in conjunction with some daylight, it is quite possible that the intensity will be too high for comfort at night. Some way of changing the intensity of the light without destroying its uniform distribution is, therefore, desirable. If lamps be turned out here and there at random for the purpose of reducing the intensity to the proper value at night, the uniformity of the light is apt to be destroyed.

One method of varying the intensity without destroying the uniformity of the light consists in installing the lamps in groups, and turning out a part of the lamps in each group. This affords different intensities without disturbing the uniformity of the light. Often, however, the lamps are not in groups.

The tungsten lamp possesses one feature which can be used to advantage in accomplishing this end, whatever the number and arrangement of lamps. From the normal voltage of the lamp to about 15 or 20 per cent. below normal, the light of the tungsten lamp maintains its characteristic white color. The voltage on such a lighting system may be reduced by means of a transformer arranged with a number of secondary taps to give voltages below normal, thus permitting a change from normal intensity to lower values without noticeably affecting the white quality of the light. This method has been used and furnishes a convenient scheme of varying the light intensity without destroying the uniformity of distribution.

End Motion of a Rotating Journal

By Lucien E. Picolet

It is common experience that when a shaft is running, even under a heavy load, very little effort is required to move it axially in its bearings, and when it ceases to rotate the effort required is enormously increased. In the latter case the effort is evidently the product of the load and the coefficient of friction.

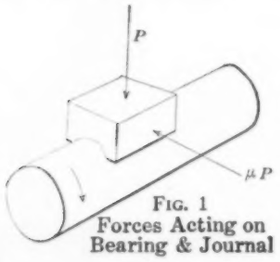


FIG. 1
Forces Acting on Bearing & Journal

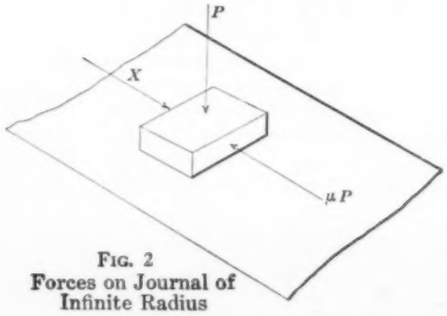


FIG. 2
Forces on Journal of Infinite Radius

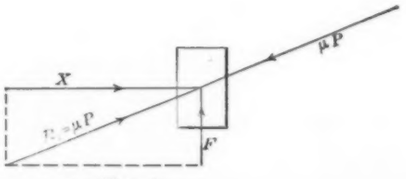


FIG. 3
Effect of Axial Force
American Machinist

END MOTION OF A ROTATING JOURNAL

Fig. 1 represents a loosely fitted bearing resting upon a journal and carrying a load P. When the journal rotates, the bearing is maintained in position by a force $u\,P$, acting opposite to the direction of rotation and equivalent to the tangential effort due to the friction, u being the friction coefficient.

For the present purpose the journal and its bearing may be represented as in Fig. 2, by a block supporting the load P and resting upon a flat surface. If the block slide uniformly under the force x, obviously $x = u\,P$. Suppose now, another force F be applied perpendicular to x, as in Fig. 3. When the block is on the point of sliding, the resultant R must be $u\,P$, since the resistance to sliding is the same in all directions. It at once follows that the application of the force F, however small, changes the direction of sliding from the direction of x to the direction of R and a gradual creeping takes place in the direction of F. It is clear that this end motion will occur, no matter how small F is, or how great the friction, because R will always be the diagonal of the rectangle formed by the forces x and F, and R will change its angle, though not its value, to suit the value of F.

Another effect of the end motion influences the journal friction of rotation. The component x is always less than R, which must be $u\,P$, and the friction of sliding in the direction of x, which is the journal friction, is now diminished, and becomes

$$x = \sqrt{R^2 - F^2} = \sqrt{u^2P^2 - F^2}.$$

Reducing journal friction by means of an axial motion would be both difficult to accomplish practically, and would fail to effect any real gain, for the total work done in overcoming the resistance $u\,P$ along the diagonal path is necessarily greater than that along its normal direction when there is no axial force. Some forms of delicate apparatus, however, do employ rapid vibration by an electromagnet, to increase sensitiveness by reducing friction.

But why is the axial resistance so small when the shaft rotates? Is it becaues of the film of oil formed reducing the coefficient? The phenomenon is such a familiar one that it appears to be generally dismissed as self-evident and probably the majority of observers, if asked for an explanation, will at once suggest the diminution of friction from the rotation of the journal.

While it is, of course, true that diminution of friction lessens resistance to end motion regardless of other considerations, it may be demonstrated that, barring such effects as cutting and seizing, an axial force, no matter how small, will produce end motion of a loaded journal independent of the magnitude of the friction.

Letters from Practical Men

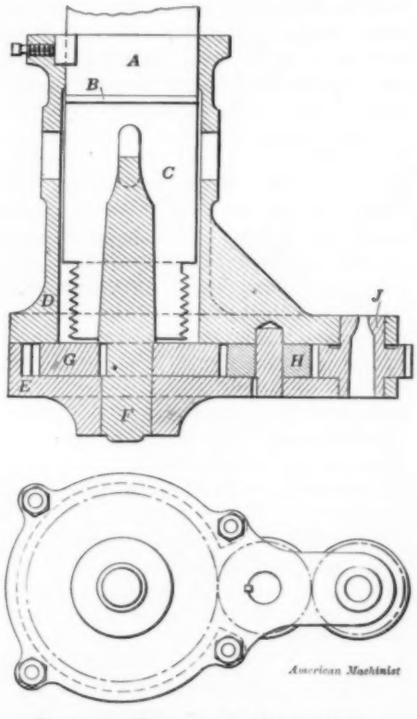
Concerning the details of making things in machine shops, from the first sketch to the shipping room.

A letter good enough to print is good enough to pay for. The value is in the idea—not the length of the letter.

Drilling Awkwardly Located Holes

A recent issue of the AMERICAN MACHINIST had a description of a hand-operated tool under the above heading. The article in question brought to mind a fixture for a horizontal drill press to do much the same kind of work on a larger scale.

In the accompanying line cut *C* is the drill-press spindle, *A* is the sleeve it runs in and *B* the fiber thrust washer. *F* is an arbor on which is mounted gear *G*. It is turned on the end to fit a No. 5 taper of spindle. The end outside of *G* has a bearing in the cover plate and a teat turned on the end for driving the same home. *D* is the case or body of the fixture that



DRILLING DEVICE FOR AWKWARDLY LOCATED HOLES

slips on the sleeve of the drill press and is held there by a set screw and taper key.

This casing is cored out top and bottom for a drift for releasing the arbor. *E* is the case cover which has bearings for the arbor, intermediate gear pin and drill socket gear. It is fastened to the housing by four studs as shown in the end view. The intermediate gear *H* revolves on a pin that is supported by both the cover and case.

Gear *J* is supported in the same manner and is bored out to receive a taper drill shank. This gear has a fiber thrust bearing in the rear that is shown in the sketch, but not marked.

The operation is, of course, obvious. The housing or case is kept from revolving by the key and set screw. The drill is driven in the same direction as the spindle and at about twice the speed, through intermediate gear. The feed is, of course, governed by the drill press proper. The work may be done in either direction by the reversal of gear drill socket *J*. That is, the drill may be pushed into the work, or if the gear and feed are reversed, the drill may be pulled into the piece being drilled. Convenience, of course, governs direction of feed.

The fixture was originally made to drill set-screw holes in engine eccentrics. The amount of space demanded for drilling is chiefly dependent on the length of the drill. The fixture itself takes up three inches. With a drill two inches long it would drill a hole 2 inches deep and need five inches to do it in.

The device was originally made as a "one-purpose" tool, but shortly after completion more than paid for itself on an outside job which made its appearance.

Detroit, Mich. JOHN BAILEY.

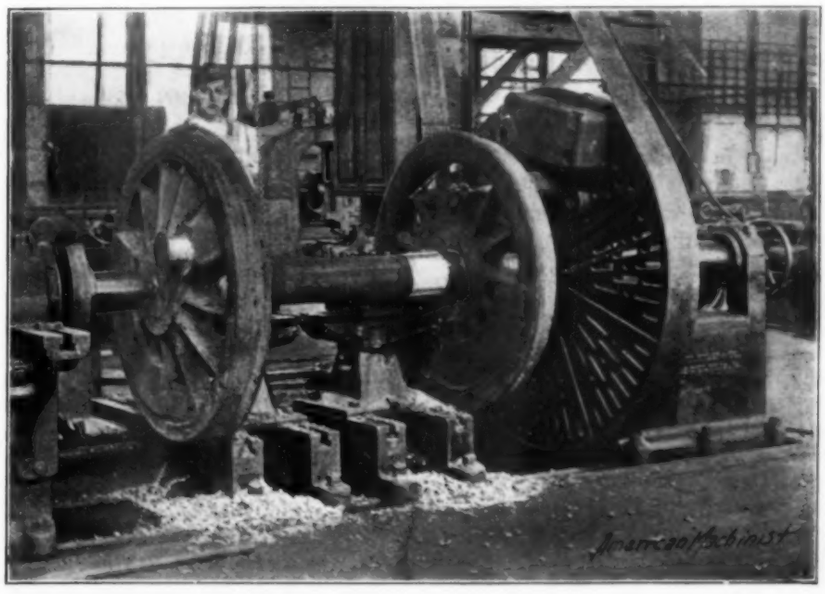
An Axle Turning Lathe

About two years ago we experienced a great deal of trouble with driving boxes pounding, main- and side-rod bushings heating and hot crank pins on engines turned out of shop after receiving general repairs. After a thorough investigation it was decided that the cause was mostly due to the fact that driving journals were not true.

At that time we were compelled to true up the journals on a tire-turning lathe. This required from three and one-half to four hours for each pair, at the same time delaying the work of turning tires and crippling our output very much. As we only had two tire-turning lathes we could use, no journals were trued up except those that were cut or badly out of round.

In order to true up all journals and do them quickly, it was decided to convert the old 68-inch lathe shown, into an axle-truing lathe. The rear face plate and pinion gear shaft were removed and machine was driven in usual manner by countershaft and internal gearing on front faceplate. While this was an improvement it was entirely too slow.

The foreman then suggested the pres-



AN AXLE-TRUING LATHE

ent method and I have never seen or heard of a machine just like it in a locomotive shop. We are now turning and rolling a pair of journals in 40 minutes as compared with 3 hours and 30 minutes the old way and at the same time practically eliminating the trouble mentioned above.

Peoria, Ill. D. ANVILLE.

Graduating a Scale on Milling Machine

I had occasion to do a graduating job some time ago which at first appeared very odd. The scale was about a foot in length and the graduations had to be 0.0206 inch apart. The method I used in obtaining this move of 0.0206 inch was as follows:

The dividing head of a No. 2 Brown & Sharpe universal milling machine was geared up to a spiral of 40.375 inches, just as would be geared up for cutting spirals. I selected an index plate with 49 holes in circle; therefore, 40 turns of the index crank would equal

$$40 \times 49 = 1960 \textit{ holes.}$$

Now, then,

$$1960 \times 0.0206 = 40.376 \textit{ inches,}$$

which gives us an error of 0.001+ inch in 40.375 inches lead.

Then to obtain a move of 0.0206 inch, gear up the dividing head for a spiral of 40.375 inches. Use a 49 circle and make the moves from the dividing head, using the back stop pin behind the index plate. One hole is required for each move.

Gears for spiral of 40.375 inches are as follows:

$$\frac{10}{40\frac{3}{8}} \times \frac{8}{8} = \frac{80}{323} = \frac{8 \times 10}{17 \times 19}.$$

$$\frac{8}{17} \times \frac{3}{3} = \frac{24 \textit{ (regular)}}{51 \textit{ (special)}},$$

and

$$\frac{10}{19} \times \frac{4}{4} = \frac{40 \textit{ (regular)}}{76 \textit{ (special)}}.$$

Gear on screw equals 40; first gear on stud equals 24; second gear on stud 51, and gear on worm equals 76.

To prove that these gears would give me the result required, I worked back again; thus,

$$\frac{51 \times 76 \times 10}{40 \times 24} = 40.375 \textit{ inches lead;}$$

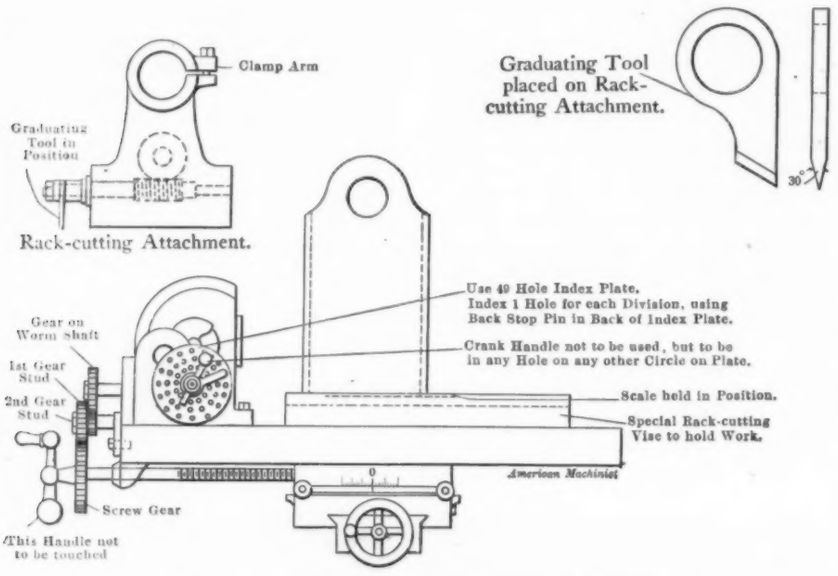
and, 1960 holes divided into 40.376 = 0.0206 inch, as the move equal to one hole in a 49 circle, which would be but 0.001 inch error in 40⅜ inches.

The table, or saddle, swivel was left at zero, as shown in sketch. A special vise, 24 inches long, same as used for rack cutting, is shown clamped in position on table, and the scale to be graduated was placed in this, lying on a parallel of suitable hight, so that we could get all possible hold on scale.

The regular rack-cutting attachment furnished with machine, as shown at upper left-hand corner of drawing, was then placed on machine in its regular position. On this is seen the graduating tool used, this being stationary on the attachment. The cross feed was operated in graduating, and no power was used, as all work was done by hand. The tool simply scribed a line 0.002 inch deep, each time the work was moved back and forth, and each time this was done we simply indexed one hole in 49 circle, using *back stop* pin. Do not use the crank handle for indexing, and do not touch the ball handle on screw.

Before starting the graduating operation, one complete revolution of the index plate was made in same direction as the moves, as this took up all back lash and lost motion, insuring the proper start.

EDWARD J. RANTSCH,
Inspector E. W. Bliss Company.
Brooklyn, N. Y.


Clamp Arm
Graduating Tool in Position
Rack-cutting Attachment.
Graduating Tool placed on Rack-cutting Attachment.
30°
Use 49 Hole Index Plate. Index 1 Hole for each Division, using Back Stop Pin in Back of Index Plate.
Crank Handle not to be used, but to be in any Hole on any other Circle on Plate.
Scale held in Position.
Special Rack-cutting Vise to hold Work.
Gear on Worm Shaft
1st Gear Stud
2nd Gear Stud
Screw Gear
This Handle not to be touched
American Machinist

GRADUATING A SCALE ON THE MILLING MACHINE

Micrometer Case

From ⅛-inch cigar-box boards, ¼-inch ordinary boards, a little felt, two pairs of small, common, brass hinges, a few nails and a little glue, I made the case, holding 1-, 2- and 3-inch micrometers, shown in the drawings.

Fig. 1 shows the plan, front and end elevations. Fig. 2 shows the details of the trays. No means of holding the front and top closed are shown, but a small lock or brass hooks may be used, as suits the individual.

In making the 3-inch, or bottom tray, the arc is laid off as shown, or the micrometer itself is laid on the ½-inch board, and its outline penciled. It is then cut with a jig saw to conform to the frame of the micrometer, glued to an ⅛-inch board, and the two glued or nailed to the ¼-inch board, which forms the bottom of the tray and also of the box.

The top, or 1- and 2-inch tray is made in the same manner, save that the ⅛-inch board is cut through for the barrel of the 1-inch micrometer to pass. Then

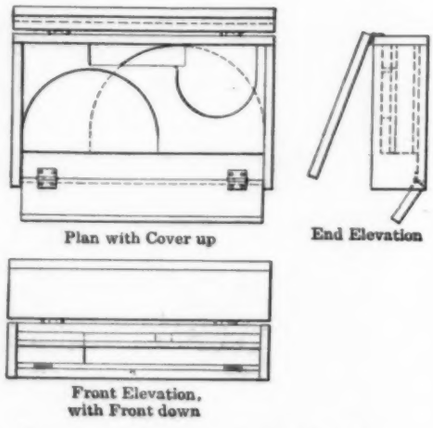


FIG. 1. CASE FOR 1-, 2- AND 3-INCH MICROMETERS

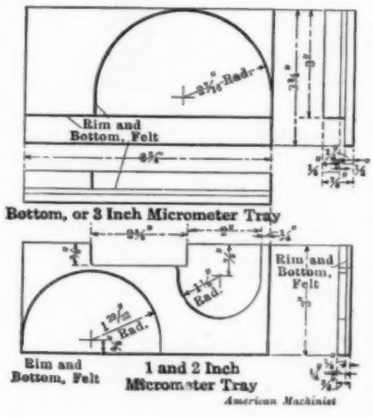

Rim and Bottom, Felt
Bottom, or 3 Inch Micrometer Tray
Rim and Bottom, Felt
1 and 2 Inch Micrometer Tray
Rim and Bottom, Felt
American Machinist

FIG. 2. DETAILS OF TRAYS

the top tray is nailed to the bottom; ends, back, top and front are added, and the parts coming in contact with the micrometers faced with felt. The case is then complete.

The barrels of the 2- and 3-inch micrometers lie in the space between the front edges of the trays and the front of the box, making them very easily removed.

The dimensions given suit the Starrett company's micrometers, style No. 226; although, with very little variation, it will suit any make.

Other details are: Ends (2), each 4 inches long, 1½ inches wide, ¼ inch thick; back, 7¼ inches long, 1½ inches wide, ¼ inch thick; front, 6¾ inches long, 1¼ inches wide, ¼ inch thick; top, 7¼ inches long, 4¼ inches wide, ¼ inch thick.

WM. E. WHITE.

Providence, R. I.

The Parting of Patterns

As this deals with a class of patternmaking and molding that is being made almost every working day in pattern shops and foundries throughout the country, it should particularly interest not alone the patternmaker but the molder as well.

While working at the molding trade I was more than surprised at the large number of patternmakers who knew little or nothing about molding, that is, practical molding. Some of the patterns would command a high price if sold for parlor decorations, owing to the high-class finish, as they were made by men who were not up in foundry practice. I can better describe my ideas by the two simple pieces in the accompanying halftone. Fig. 1 is a counterweighted foot lever and Fig. 2 a counterweighted bell crank; each to be made in cast iron. On account of a number of rush jobs in the pattern shop these patterns were sent to another shop to be made. The order read: *"Make pattern solid, do not split."*

When the patterns were received it was found that pattern, Fig. 1, was split on the line *C D*, and pattern, Fig. 2, was split on the line *A B*. An explanation was demanded from the patternmaker as to why he ignored the order *"Make pattern solid, do not split,"* and the answer was: "I made it the correct way."

We have four sizes of these same patterns and fortunately there were in the shop at this time about eight castings as in Fig. 1 and 17 as in Fig. 2. The molds were all made from a solid pattern; Fig. 2 was molded on the side and Fig. 1 on edge, above *F G* being in the cope, with *H* a loose piece.

I called the patternmaker's attention to these castings and asked: "Can you see anything wrong with them?" to which he replied: "I can not." "Then," said I, "why do you, as well as other patternmakers, introduce that *'correct way'* for making patterns, when the real facts in the matter are, your education on molding and foundry practice in general has been sadly neglected, consequently, you are not qualified to pass judgment and say that this or that pattern is or is not made the *'correct way.'* The fact that you can carve, turn, shape and assemble a piece of work on which you afterward put a piano finish does not prove that you are a patternmaker any more than it proves a man is a molder because he is employed in a foundry. I always admire the mechanic who can suggest a *better way* to do a piece of work, but for the *correct-way* man I have no time."

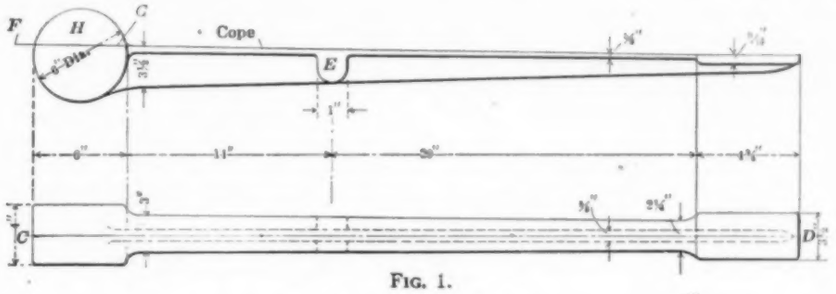


FIG. 1.

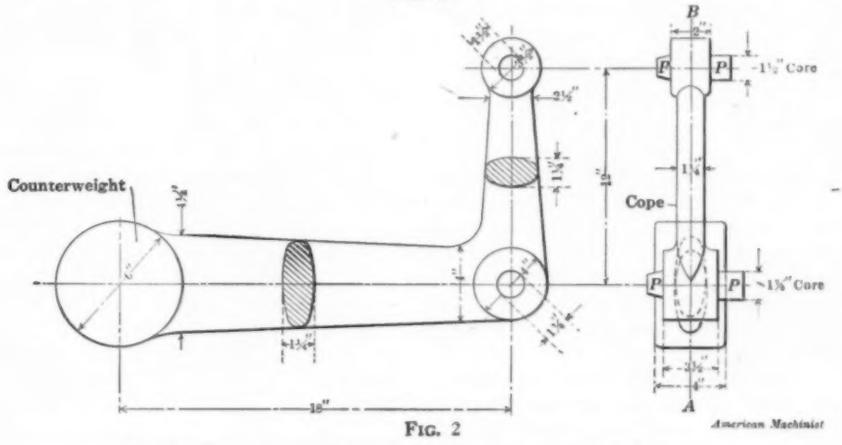


FIG. 2

SIMPLE PATTERN TO ILLUSTRATE PATTERN-PARTING LINES

Before making the patterns for these I first inquired what the castings were for and the important details that might require close work. After learning that I was not restricted in the amount of draft on the patterns I made them solid. The counterweights I made with ⅛-inch draft from the center each way; the ribs and other details in like proportion.

Core prints we do not use. The system in this shop is, when a round hole is called for on the drawing to bore a ¾-inch hole in the pattern and mark the size of core wanted. The foundry is supplied with all kinds of cores from 1 inch up to and including 3 inches.

We made 15 castings from one and 25 castings from the other and not a word of complaint has come from the molder or foundry proprietor. The pattern is in perfect condition and ready to be sent to the foundry at any time. These are not the conditions usual with the split pattern; after a few castings are made it begins to assume all sorts of shapes and before the order is completed the pattern is out of commission and requires the attention of the pattern department.

I have always taken a deep interest in the pattern and foundry trades and would be much interested to read the experiences of others. What I am particularly interested in is the jobs that come up every day—the simple job—I have no desire to know anything about how the Brooklyn Bridge could be made in one casting. I am like the man, who, after reading an article on "Making a 24-foot flywheel" remarked: "That's too strong for me, what I'd like to know is, how many castings can be made in a (sand) mold before it is broken up."

Milwaukee, Wis. R. J. D.

Testing Casting without Facing Flanges

In the course of a call at the works of a good-sized concern using a large number of castings, I was struck by the fact that most of these were tested prior to machining of flanges. Usually it is found necessary to rough turn flanges in order to make a joint to stand pressure.

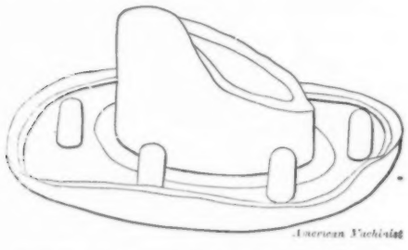
It is obvious that the cheapest type of joint must be costly where considerable testing is done, as large surfaces have to be tight under the test pressure and where the flanges differ greatly both in shape and size, expenditure on joints for

testing must be considered unproductive outlay.

The majority of the castings used had two flanges parallel to each other, and testing was carried out by circular floor and cover plates. The bottom plate had slots for tee-head bolts, and a pipe from accumulator in center. Tee-head bolts, external to the job, were used to tighten upper plate onto the top flange.

The substance used for the joints is gutta percha; fairly expensive, but the peculiar beauty of the material is that it can be used over and over again, a short immersion in boiling water making it plastic.

The process of making joints consists in taking from the hot-water tank (always kept boiling) a large poultice of the material and putting it onto the lower test plate; the casting is then placed on the still warm gutta percha and a similar



ODD SHAPE INTO WHICH MATERIAL IS SQUEEZED

poultice is placed upon the upper flange; top plate is bolted on and immediately water from service main is turned on to fill casting, followed by water from accumulator. After testing, the joint comes away whole, but hard, and is put back in boiling water tank to become again plastic.

I am informed that there is practically no waste of material and never a leaky joint, even on quite rough surfaces. The excess material anchors itself, or rather is squeezed into the bolt holes and interior of flange rim. With 56 pounds of gutta percha it is possible to be continually testing with sufficient plastic material in hand. The softening is readily and quickly done by a properly fitted boiling tank, heated by a gas ring.

The material has its limitations, as it can be used only for cold-water testing, and it is not recommended for permanent joints. The firm using it is convinced that quite a large sum of money is saved annually by this means.

As it was not possible to obtain photographs of the curious forms into which this novel jointing had been squeezed, the rough sketch annexed may give some indication of the joints as removed from flanges.

Water pressure used is 300 to 500 pounds per square inch, and the flanges on castings vary from 4 inches to 48 inches diameter.

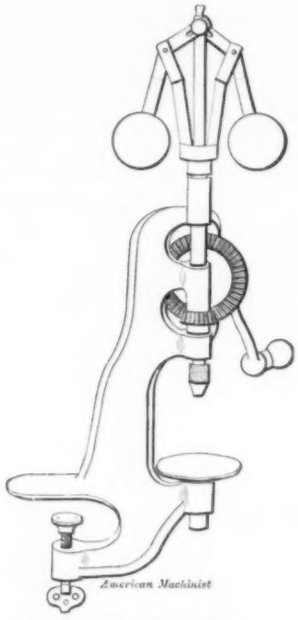
London, England. A. L. HAAS.

A Feed That Is Different

I inclose a new type of sensitive feed for a bench drill, taken from a local paper. It is certainly different but hardly comes up to its trade name of "Ideal," which it is called.

According to the description the "governor acts in a dual way, serving as a flywheel and, simultaneous with their distension acting as a means for automatically feeding the drill."

The fallacy of this is evident when we consider that the balls only move upward when the speed is *increasing*, and cannot



SENSITIVE FEED DRILL

act as a feed when run at any constant speed.

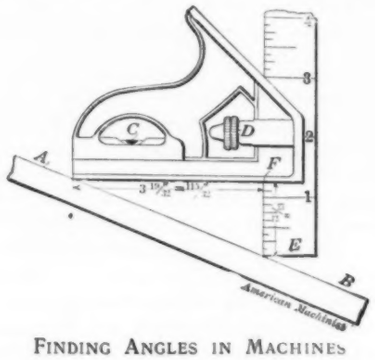
Streatham, England. A. C. WILD.

Finding Angles in Machines

When making drawings of a machine already constructed, the draftsman often finds it necessary to determine and transfer to paper the several acute and obtuse angles made by certain parts of the machine, such as levers, springs, etc. To obtain these angles by means of the protractor sometimes requires a great deal of making ready. I frequently make use of the following method and find it fully as accurate and in some cases, more accurate, than any reading which can be obtained from the average protractor. All the tools required will be a surface plate or a level foundation for placing the machine upon and an adjustable try square, as shown in the line cut.

For example, let it be assumed that the line *A B* is the top of a lever, the angle of which is to be determined. Select an accessible part of the lever and place upon it the heel of the adjustable try square, as shown, then loosen the thumb nut *D* and draw the blade *E* through the square until the level bubble *C* comes to rest in the central position shown. Then tighten the thumb screw *D*, look the square carefully over again and see that the heel bears fair upon the lever at *A* and that both portions of the square be parallel with the lever *A B*.

It is, of course, understood that the shaft or ordinary finished portions of the machine has been accurately leveled or plumbed before attempting the above described operation. Having found *C* to be exactly in the center and that the screw *D* is tight, the instrument may be removed and the angle *A D* determined in the following manner: Measure the distance *A* to the near edge of blade *E*, which in this particular make of try square, was found to be $3\frac{19}{32}$ inches which



FINDING ANGLES IN MACHINES

equals $\frac{115}{32}$ inches. A reading is then taken at *E* and the distance to the head of the square on the blade, is found to be $\frac{43}{32}$ inches.

It is now very easy to transfer these distances to paper, whereupon the angle may be read direct by means of a protractor or by plotting the distance *A F* and *F E*, the angular lever line *A B* may be laid down upon the drawing. It is also possible to solve this angle without further calculation, by means of the slide rule and the scale of tangents on the reverse side of the rule. It is also possible to procure or make a scale to use for angle determination which will save an operation in division now necessary to reduce the radius *A F* to unity. All that is needed for this purpose is to procure a scale to be used in place of *E* on which the distance *A F* has been laid down and divided and subdivided into one hundred equal parts, then the reading will be; *A F* equals the radius and *E F* equals the tangent. The angle may be taken directly from a table of natural tangents or determined by the slide rule.

Divide 43 by 115, then the quotient 0.374, will be the length of the tangent when the radius = 1. Set the lower scale of rule to 0.374 and then turn the rule over and read the angle, about 20½ degrees, opposite the mark on the back of the rule.

South Bend, Ind. JAMES F. HOBART.

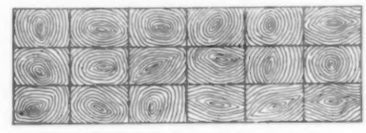
Wooden Block Factory Floors

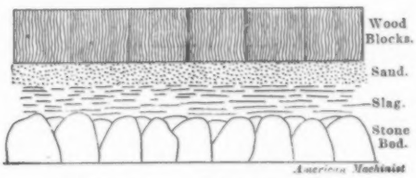
With regard to the problem of shop floors, in this country practically all workshop floors are of wood-block paving as described below.

The wood used is a soft deal impregnated with chloride of mercury ($HgCl_2$) cut in blocks with the end grain upward, that is, the top surface presents a section across the grain. The blocks are about five inches high, four inches thick and about five to six inches wide.

They are placed on a bed of stone eight inches deep, a layer of sand and slag of five inches being arranged between the two for drainage purposes and to render the floor more elastic. See the illustration.

It is of great value in machine shops not to make the floor too hard, as in case a heavy piece of work falls (owing





WOOD-BLOCK FACTORY FLOORS

to the crane rope breaking for instance) the wooden blocks are driven into the ground but the piece of work is seldom damaged.

The wooden paving is sometimes placed on a cement bed. The floor is then harder and requires less repairs, but is considerably more expensive.

Baden, Switzerland. C. A. POWEL.

Fixture for Gas Engine Piston

I have noticed from time to time in the AMERICAN MACHINIST sketches and descriptions of various rigs for machining or grinding pistons for automobile engines. While all of these were good for their purpose, there have been few that could be applied to large gas-engine pistons.

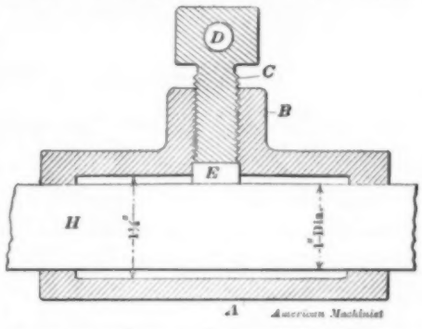
The accompanying line-cut is of a rig got out for finishing these pistons. The piston castings are delivered from the foundry with about 2 inches of head on, to insure sound castings, and have a bar cast across to hold the center while rough turning, also to drive by. It is first roughed down to between 0.020 and 0.025 inch of finished diameter. The grooves for rings are completely finished both for depth and width, and the head parted off.

The piston is then bored and faced for the pin. The dome end is dropped into a ring or sleeve and rests on pieces of packing inserted in the ring groove *A;* the packing being a good fit in this groove. It is then clamped down and machined. For finishing the diameter, a rig, as shown, is used. Originally this was screwed to fit the spindle nose of a lathe, but as the pistons are now ground for finishing this has been replaced by a center, as shown. The grinding gives a better job and the finishing time is reduced, as the taper on the diameter at the dome end is more easily obtained on the grinder than on the lathe.

Nottingham, Eng. GEORGE HEY.

Straightener for Steel Bars

We use considerable bright drawn-steel bar, from which to turn small shafts; say, three feet long and one inch in diameter. The bar, though parallel and to standard dimensions, is often afflicted with objectionable bends. Before



STRAIGHTENING BRIGHT-STEEL BARS

turning, therefore, it has to be straightened to within a few thousandths.

The usual method of straightening with a bar, with each particular shaft between centers, does not result in a good job; moreover, it is bad for the lathe and lathe centers.

To overcome this we devised the bar straightener shown in the accompanying line cut. It is cheap and can be quickly made, complete, by the lathe hand. This one is for a 1-inch bar and was turned and bored from a 2¾-inch bar; the large diameter being used to provide ample thread distance for the straightening screw.

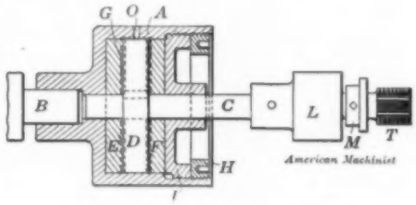
The straightener is shown in section on a shaft. *A* is the turned sleeve, *B* the extension for the screw hole, *C* the cast-steel screw, *D* the hole in the screw head for a lever and *E* a brass pad to prevent the straightened shaft from being bruised. The shaft to be straightened is shown by *H*. The method of using the straightener can be plainly seen.

London, Eng. J. T. T.

A Special Friction Chuck

The chuck illustrated in the accompanying line cut was originally designed to prevent breakage of small taps in the manufacture of brass goods; but the principle on which it is built, is susceptible of some other applications.

In the cut *A* is the body, to be fixed in any convenient way to arbor *B* of the

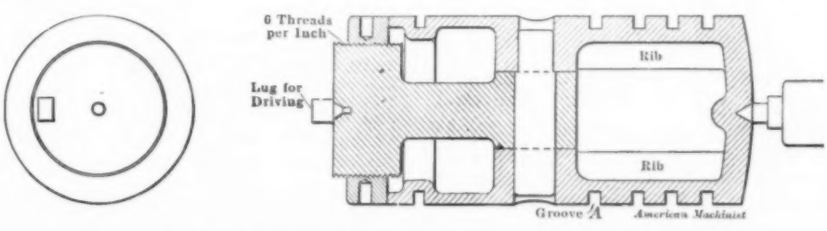


A SPECIAL FRICTION CHUCK

lathe, drill press or other machine employed; *C* is the tool-holder shank that is keyed to, or forged in one piece with steel disk *D*, these being machined so as to remain central to body *A*. *E* and *F* are two fiber disks, provided with grooves *G* to distribute the lubricant, coming from hole *O*, over the surfaces in contact with steel disk *D*. It is preferable to cut these grooves in the fiber disks rather than in the central steel disk, to avoid any cutting action on the fiber. *H* and *I* are a nut and lock nut that serve to regulate the pressure against the faces of disk *D*.

When in operation the friction exerted against the faces of disk *D* will cause the same, and consequently the tool fixed to shank *C* to revolve with body *A;* but should the resistance offered to the tool by the work become too great, or sufficient to overcome said friction, the chuck is free to revolve together with nuts *H* and *I* and disks *E* and *F*, while disk *D* remains stationary. A tap *T* attached to the extreme end of shank *C*, will not break in such an event, and upon reversing the machine in the usual way it will be drawn from the work.

By tightening or loosening nut *I* the pressure against the faces of disk *D* can be adjusted so the chuck will cut a



FIXTURE FOR MACHINING OR GRINDING GAS-ENGINE PISTONS

certain number of threads and no more before the pressure is overcome by the resistance offered by the work. With a drill, reamer, or any other tool the chuck can be regulated to perform a certain amount of work, and no more. The same object can be obtained usually by the use of a stop collar *M* whose position is adjustable on the shank of the tool. When the face of this collar reaches the surface of the work it will stop the progress of the tool, and increase the resistance to its revolving motion, while as before, the chuck proper is allowed to follow the motion of the machine. In the case of holes to be threaded to the bottom, even this collar is unnecessary, as the tap itself upon reaching the bottom of the hole will act as a stop.

Another interesting application of this chuck is the screwing of flanges on pipes. The chuck put in a pipe-threading machine of the usual design; the end of the shank being fitted with a collar with four pins destined to hold the flange to be screwed on. The pipe is held between the jaws on the carriage and by means of the handwheel the pipe is advanced toward the flange, and is screwed on the pipe in a manner analogous to the cutting of a thread with cutting dies. In this instance it is interesting to note that no revolving of the machine in the opposite direction is necessary.

In all operations where it is important to prevent breakage of tools, or to stop the work automatically at a certain depth, without need of stopping or revolving the machine in the opposite direction, the application of this simple device will be found most useful. If some manufacturer would take up the manufacture and sale of a series of these chucks of different sizes, and designed for different classes of work, he would probably make it pay.

New York. GUIDO SACERDOTE.

Boring Head for Milling Machine

When a man manages to get into a small shop where good work is expected and little or no equipment is on hand to do the work with, it really puts his ability to a test and he at once realizes how little he knows in spite of the many years of earnest and conscientious application devoted to mechanics.

Not so long ago several jigs accumulated that had to be bored for bushing holes; the old method of building jigs here was to lay out the holes as carefully as possible and drill them on the drill press. The accuracy acquired within reasonable limitations was anywhere from 1/32 to ¼ of an inch; decidedly good work under the circumstances.

As many jigs were in need of bushings accurately placed, I designed the accurate universal boring head to do the work with on our Bullard milling machine. The details of this head are shown in the accompanying line cuts.

Fig. 1 shows the machine-steel head with shank tapered to fit the miller. *A* is the tool holder of machine steel, dovetailed on one side and straight on the other. It is threaded to receive the tool-steel adjusting screw *B* and bored ½x1⅛ inches deep to insert boring tools and short drills so that they may be fixed by the set screw *C*. These are brought into action by the tool-steel adjusting-screw *B*, which is supported on top at *D* and held in position by four fillister-head set screws and two dowel pins. The head is counterbored deep enough to allow the bent collar on the adjusting screw to drop in flush. It is graduated on the bevel to register the movement of 0.001 of an inch, and also positioned on the bottom by E. The drawback collar *F* is fixed to *B* by set screw *G*.

By setting tool holder *A* at the required working point, with set screw *C* securely fastened, and bringing into play binding bolt *H*, which travels along with *A* in a T-slot, the head is ready for service and assures accuracy, precision, rigidity and durability.

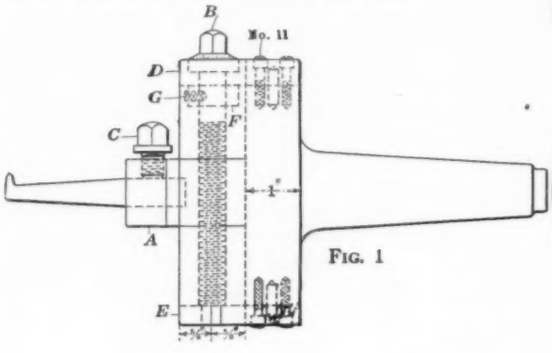


FIG. 1

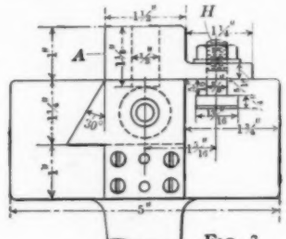


FIG. 3

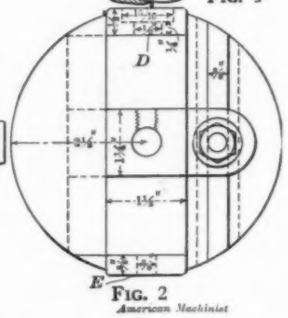


FIG. 2
American Machinist

ACCURATE UNIVERSAL BORING HEAD FOR MILLING MACHINE

CHARLES M. PARK.

Waukesha, Wis.

Hours of Labor vs. Hours of Thought

Hours of labor are certainly decreasing. Where the decrease will end I do not know nor do I care. What troubles me is that hours of thought seem also to be decreasing faster than ever before, which is the reverse of politic in the case of a man who wants to get ahead. In fact, the only justification that for the moment appeals to me for the reduction of working hours in the increase of thinking hours.

It seems odd to look about and see with what care we account for the working time with its attendant time clocks and elaborate cost systems and yet pay little or no attention to the amount of thought out of which we are buncoed every day. The lamentable fact seems to be that most of us are built after the classic plan of Lincoln's steamboat; when we think we have to stop working and when we work to stop thinking. Of course, I realize that there are some, a few of us, who stop work when thinking is unnecessary. We may want to light our pipe.

There is a vital question here for any manager to decide, and that is, how much thinking he will allow in working hours, and likewise how much thinking he will expect outside that time. The two extremes may be found in the laborer in the ditch and the philosopher in his tub. Neither is very enviable. The proper place is between the two. The laborer who thinks enough to enable him to save his back without slowing his work, gets promoted to boss eight or ten of his fellows. A little more thought puts him higher, and so on up, until the point comes when the man becomes unwilling to act in proportion to his thoughts, and then we see him sliding down hill through successive stages as college professor, poet or philospher. The top of the curve is reached in the "captains of industry," men who think and act in such proportions that to think is to act. They may not have the thinking capacity of the philosopher. Probably if they had they would be philosophers. They may not have the muscle and endurance of the laborer. Possibly if they had they would be digging in ditches. Probably all of us find our places in life according to the balance between our physical and mental activities in which the value of the mental is the greatest only so far as it stimulates and supplements the physical. When the point is reached where we prefer to sit and think and our thinking fills us with no ambition to do, we have passed the point which the law of diminishing returns defines as that of our greatest value to the world.

Springfield, Mass. CON WISE.

Discussion of Previous Question

"Rounding Flats" on Hobbed Gear Teeth

Letters from our readers showing how many men of many minds look upon various subjects opened up in previous numbers.

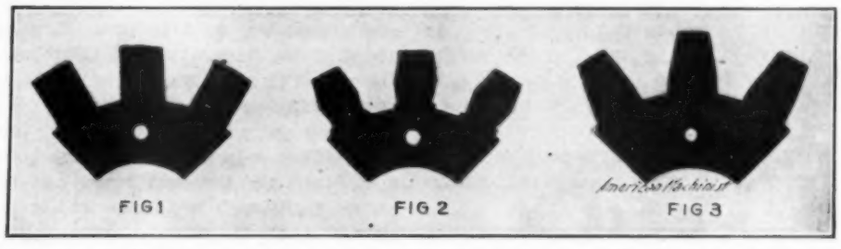
That stone slung from across the big pond came very near the mark, considering the distance. In fact, it just knocked a chip off the edge of the target without doing it any serious injury or putting it out of service.

Under certain ill defined circumstances Mr. Groocock is right and the "flats" will be rounding, but unfortunately for the hobbing machine the circumstances favoring a rounding flat are not those of actual practice. I am still in position to claim, and prove the claim, that the working surfaces of gear teeth cut with a hob having its cutting teeth relieved so that they can be sharpened by grinding must be and always are made up of narrow flat facets with ridges between.

Whether these flats are detrimental or beneficial, ornamental or otherwise, is wholly a matter of opinion. I am not now measuring amounts but am stating facts and combating the claim of the friends of the old-new hobbing process that it is theoretically correct and sure to send the formed-cutter process to the scrap heap. The hobbing machine is all right for spiral teeth, and for stocking out straight teeth to be afterward finished with a formed cutter, but I predict that it will never drive the old-style machine out of business.

What are the conditions favoring "rounds" instead of "flats?" Experiments now going on appear to indicate that the working angle of the tooth is the determining factor. If the angle is zero, the sides of the cutting hob tooth being parallel, it will cut a tooth space with flat sides only when the axes of the hob and of the gear blank are at right angles and the rotation of the blank is zero. It will then cut a straight slot in the blank and it may be considered the limiting case. If the working angle is very small, the axes may be at a small angle with each other, and the blank may have a corresponding small rotation without producing rounds on the sides of the tooth.

Fig. 1 is a section of an actual gear of twelve teeth hob-cut under ordinary circumstances, with the hob tooth of the ordinary angle of 29 degrees, the hob having but one cutting tooth. The sides of the teeth are practically flat. The unaided eye cannot perceive the rounding of the sides, but a straight-edge laid on the surface shows a little light at the ends. In this case Groocock's theory requires a rounding surface approximating closely to the very round true working-tooth surface. As the number of teeth increases, the rounds get flatter and flatter and at some undetermined number of teeth, probably about 15, are theoretically flat. For each working angle of the single hob tooth there is a definite number of teeth for the blank, and a corresponding skew angle for the axes, for which the hob tooth will leave its own shape, with flat sides as it bottoms in the blank.



TWELVE-TOOTHED GEAR CUT WITH A SINGLE-TOOTHED HOB OF 29 DEGREES ANGLE

TWELVE-TOOTHED GEAR CUT WITH HOB HAVING THREE TEETH

SAME AS FIG. 2 EXCEPT A LARGER BLANK WAS USED

Fig. 2 shows a 12-toothed standard gear cut with a hob having 3 teeth. The interference is bad. The flats and ridges between are evident.

Fig. 3 shows a 12-toothed gear cut with the same 3-toothed hob, but the blank is larger, to avoid interference. There is still a little interference at the base of the tooth. The flats need no demonstration.

The question of rounds or flats is wholly determined by the single-tooth hob. The action of the other teeth of the multiple-tooth hob is a repetition only. One tooth will leave one flat, two teeth will leave two flats with a ridge between, and so on.

Mr. Groocock suggests that I missed by failing to consider the on-coming tooth surface. It is plain that he missed by failing to consider the on-going hob tooth. As the blank rotates the tooth surface chases the cutting tool and will overtake it and be scraped to a rounding form by it if the angle of the tool is within certain limits. It is plain that we were both trying to imagine the action, which is the most bewildering of any in the theory of the teeth of gears. I have not found it possible to obtain the highly ornamental rounding surfaces shown by Mr. Groocock's Fig. 1. They are just what is desired by the friends of the hobbing process but seem quite out of reach.

But the flat is not the major objection to the hobbed-tooth theory. Its friends claim that the process cuts the true involute gear tooth, but the fact is that it will not cut a theoretically correct gear tooth of any form under any circumstances whatever.

CLAIMS OF ANOTHER CORRESPONDENT

A correspondent claims that he has a hobbing machine that does not produce flats and that does not require the hob to be centered to avoid skew teeth. Certainly, a flatless and skewless hobbed tooth is easy, depending on details not given. I have advised this party to tell the AMERICAN MACHINIST how he does it.

The makers of the hobs used for the hobbing process are just now dividing into two camps, one advocating the ground and the other the unground hob. The former grind the surfaces of the teeth of the hob after it is hardened and claim, correctly, that a true enough hob cannot be obtained in any other way. Stop, here, long enough to consider the frightful cost of such a hob. One of the claims for the hobbing process is that it is much cheaper on the item of cost of cutters, but just figure it out in dollars and cents.

In passing, we may pay our respects to one of the claims of some advocates of the hobbing process that illustrates the curious quirks sometimes required in tight corners. It is claimed that the ordinary single-action cutter heats the blank it is cutting and expands it so that the last tooth cut is deeper than the first one. That is the limit. "Any port in a storm," as the sailor says. Just for a joke I will point out that the hob gradually heats the blank it is cutting so that it cuts deeper as it goes down. That the

hobbing process will cut a bevel gear is a new discovery.

I have just noticed Professor Sweet's contribution to the subject. He says, "When Mr. Grant set forth that the hobbed gear was a succession of flats, the thought that at once came to me was: what else was the Bilgram, Gleason and Fellows?"

Certainly, but with this difference. On the machines named the width of the "flats" produced by the reciprocating planing cutter, and, therefore, their practical importance, can be regulated by the feed of the machine. The Bilgram and the Gleason machines have cutters that can be sharpened without changing the form of the octoid tooth produced, and the machine can be set to take a fine chip or a coarse one. The surface will vary with the feed, a fine feed leaving a smooth surface and a very coarse feed leaving a surface with evident flats.

But, the hob cannot be set at will. The number of flats on the side of each tooth it cuts will depend on the number of teeth in one turn of the spiral of the hob. If the hob has but one tooth, the gear tooth will have but one flat, and that flat will be the whole face of the tooth. If the hob has two teeth to the turn of the spiral there will be two flats on the side of the tooth, and so on. The only way to get many flats and a smooth surface is to have the hob teeth very close together, and then they cannot be sharpened. A bur hob will cut a flatless gear tooth, but it cannot be sharpened and is soon worthless.

Professor Sweet's language leaves the impression that he rather likes flats on his gear teeth. Many do, particularly when they find that they have got to have them. If we should send out gears with teeth as flatty and as rough as much of the hobbed work we have inspected, they would come "galumphing" back again express collect. We find that it makes a great difference whether our work is inspected and passed by our customer or by ourselves.

GEORGE B. GRANT.

Philadelphia, Penn.

Burning Water

In the present volume of the AMERICAN MACHINIST, on page 775, I find under the subtitle, "Operating Principles," of the article entitled "Furnaces Using Gas and Water Only," the following: "Therefore water, which consists of two parts of hydrogen and one part of oxygen, is converted into steam and superheated to make it dry. It then becomes a combustible vapor when fed to flame."

Does this furnace really use water as fuel? Is it possible to get more energy out of hydrogen than by burning it to H_2O?

It seems more probable that the function of the steam in this burner is to force the gas through the torch at high velocity.

I believe that a calorimeter test would show that the heat developed is that due to the heat value of the gas.

Logansport, Ind. W. H. SNOOK.

Uses of Machine Tools

Mr. Riddell's comments appealed to me, especially as an ex-lathe builder. His suggestion that lathes should be so built that a purchaser could buy the simplest possible thing and then be able at to add to it is a most excellent one. The same thing is done by makers of bench lathes. A bench lathe is a very inexpensive, innocent-looking thing, but by the time you have bought all the attachments that you think you may need you find that it is as expensive as fitting out your daughter for the wedding ceremony.

An engine lathe could hardly be stripped quite so bare. A plain slide rest and a tailstock seem to be inevitable, so also does a power longitudinal feed, but compound rests, follow rests, pulley blocks, taper attachments, center rests, power cross feed, reversing countershafts, screw cutting are all readily made interchangeable, so that they may be added at any time. The last is probably the most difficult in that it implies lining up the lead screw by the maker.

This is one of the most unlikely jobs to be well done in this field, though given a well straightened lead screw and the proper facilities it is an easy job in the shop. It would be very interesting to know, but I think it is true that hardly a lathe builder in the country would dare to send out a new lathe apron to go in the place of an old one on a lathe and expect it to go in place without *any* adjustment, and yet that is the key to the situation, if the jig for drilling the bed for the boxes to carry the lead screw is located by the vees of the lathe. On lathes of any considerable length there is also the difficulty, due to the difference in length of beds made from the same pattern. I have put dimensions for these drilled holes on drawings, so as to read from the head end of the bed, and thus located the boxes so that lead screws could be kept in stock for all lengths of bed and kept close enough to length so that the center holes would not have to be squared out, but that is not interchangeable work. Jigs for all possible lengths of bed are impossible, on account of expense. If the tail-end journal is made without collars and a quarter of an inch longer than the box there is no difficulty, but I have a fondness for taking the thrust of the screw at that end.

It would also be possible to supply a lathe with a cone pulley, which should be designed to give the powerful drive needed for shafts up to 4 inches in diameter with the back gears in, and to give the filing speeds needed for finishing, though I would recommend a grinder for that purpose. A 14-, or even a 12-inch lathe with a three-step cone pulley, steps not varying more than half as much as now used, with the countershaft speeded for work 4 inches diameter would do a large share of the work now put in 18- and 20-inch lathes. The tailstock, carriage and usually the aprons on lathes of that size, are heavy enough for work of that character. The machines are light and handy and should be popular with workmen. Of course, every man has a stage in his career when he wants the name of running the largest lathe in the shop, but after a little of that he gets where he wants a light, easily handled machine that will do the work and let him stand and look on.

THE RADIAL DRILL QUESTION

It seems to be impossible to get a stiff radial drill without getting it so clumsy that it can hardly be used. They all spring a great deal more than most people think. I have known a builder to set the post of a drill ¼ inch back of the vertical to bring the spindle square with the bed. A drill with the post plumb will show the arm sloping downward and the spindle pointing in toward the base. Makers build their drills to test out with a sweep and show the spindle square with the base when standing idle.

The moment a feed is put on the drill, up goes the arm, out goes the bottom of the spindle and the hole is not plumb. Of course, a hole can be bored vertical with a boring bar and a light chip, but that is not what radial drills are designed for. From the very nature of its design a radial drill can hardly be considered a tool of precision. A horizontal boring machine can be built to do much more accurate work but is only a fraction as handy on the great bulk of work done.

GOOD WORDS FOR A COST SYSTEM

The article on cost keeping, at page 876, is one of the best yet. I am still hoping to see someone formulate this whole matter and arrange it so that we can each analyze our own business and determine beforehand how minutely we should keep costs and how minutely we should divide the distribution of overhead charges. It seems that there are basic principles applicable to the smallest shops and it also appears that as a shop grows it needs a more finely divided system for which it luckily has more money to spend.

Of all things it should be borne in mind that a cost system should not interfere with the adoption of the easiest way of manufacturing work. It is oftentimes more economical to do some small job in an expensive way than it is to break up another job to get the first one done in a hurry. Unless costs are watched by a man that knows all these

things and understands them, it is likely to work to the disadvantage of the shop. The successful manager is a man who knows when to and has the nerve to pay a high price for what he must have then and there to make the rest of the shop run smoothly.

NONCLOGGING FILES

After reading Mr. Sepas' suggestion for a pencil sharpener it occurs to me to ask why it is that a Swiss file will sharpen pencils for years and an American file only for weeks? The American file clogs but the Swiss file keeps clean and sharp.

Springfield, Mass. CON WISE.

How Shall Our Boys Learn a Trade?

Reading the article entitled "How Shall Our Boys Learn a Trade?" by W. D. Graves, on page 531, has prompted me to write my experiences which will answer the question to some extent. As I have hired and fired in a machine shop for twelve years, and listened to the tales of joy and anticipation (not mentioning the woe) it has given me the opportunity to know just what the boys think and how their ideas become warped, resulting in the final rut of a specialist.

When you are approached by the parents to put Jim in the shop, their intentions are good; they mean well by the boy and specify that they want him to learn the trade. I tell them, to do that, it will be necessary for me to shift him from one division to another so that he may absorb what he can in each, and by moving him around and giving him a better quality of work as he improves in ability, we can make an all-around machinist of him; but it will take some time to do it and he will not earn as much as if he stayed in one division.

This point is where parents are inclined to be lax and back down, thinking only of the present, or near-future earning capacity, which is often compulsory due to circumstances. When a boy makes application for work, it is in extremely rare cases only, that he states that he wants to learn the trade. What he wants is a job, because he must earn some money, and all he can get of it; to learn the trade is a secondary consideration. Even those who have started in with that intention, after having worked for months in one division, at the time they should be changed to another branch of the trade have acquired sufficient skill to earn two dollars or more a day and you do not hear anything more about being changed. In fact, there would be a howl if they were obliged to begin over again, so to speak, and get ten or twelve cents an hour. They are not willing to sacrifice anything to acquire the general knowledge necessary to be classed as machinists.

Boys must have better support from their parents and be made to realize, and counseled by them to realize, the necessity of learning every branch of the trade. That is one reason why we are not turning out, or making full-fledged machinists.

Some may complain that the boys are not given an opportunity, even if they have the desire. To what extent this is true I do not know, and can but say that, personally, I have done all in my power to assist those who have shown any desire to broaden themselves. And I see no reason why employers at large should be at variance with this idea, because it will be of benefit to them in the end, even if those whom they have trained do not remain in their employ. The man whom the other fellow has trained will reach you in time and give you the benefit of what you could not teach him.

In large manufacturing establishments where similar machines are counted by the hundred, with a man or boy at each, it would seem like a herculean task to shift those who were at all ambitious from one division to another. There is no reason why this could not be done with an efficient card-index system to keep track of the boys and of their progress. The question is, how many firms are willing to add their mite to the general betterment of conditions and turn out a few machinists? The inclination is to put the boys on one class of work and keep them there, it being the quickest way to get results, and in the majority of cases this suits them best.

The little jobbing shops cannot turn out enough machinists to supply the demand; neither can they turn out the required quality of workman. Where good, accurate work is done, of an interchangeable character, and manufactured in quantity, with efficient jigs and fixtures, good workmen can be produced suited to the present-day needs, having speed and ways and means of doing things that are abreast of the times. But they must be willing to sacrifice something to get it.

T. L. DENNIS.

Staten Island, N. Y.

Qualifications for Foreman

Your editorial, "Opportunities of Advancement," while being admirable and full of common sense, still lacks a little from the workman's point of view.

As the article states, the complaint from managers is the lack of thoroughness, initiative and force. Take the thoroughness failure first. In these days of competition the workmen are being trained as specialists; speed, with the ability to be correct, being the main requirement.

Some become more expert than others and are consequently considered first-class men. On this account they are kept on the same class of work day in and day out. Their thoroughness is confined to the one thing.

When promotion to foremanship comes they are at a loss because too much is expected from them. Seldom is a foreman required for only one kind of work. He must be able to detect errors and faults relating to other branches of work that of necessity comes to his department. Not being trained to this is one of the failures which is no fault of the workman by any means.

Regarding initiative it is evident that if a man is only trained in one thing, he cannot take the initiative in showing others how to do work that has only come under his observation at a distance. Again this is no fault of his.

The lack of force is probably the workman's principal fault. Being brought up alongside of men he is probably considered an all-around good fellow. No doubt his spare time has been spent with his shop mates, his family is very intimate with theirs, and a hundred other things bind him to his shop mates.

On his promotion he probably tries to do his best by his employer and in censuring some one for a fault, he is considered swelled headed and looked at with suspicion, until after something has gone wrong and he discharges a man, many of his friends cease to be intimate with him. Or if he commences to think that he has been unnecessarily harsh and overlooks faults, he loses force with the men and they soon have the upper hand. He soon learns that he must be strict again and let friendship go when it is a question of work. If he cannot do this then it is high time for him to give it up. Clearly it is his fault if he is unable to be forceful and at the same time temper his force with justice.

OPPORTUNITY FOR OBSERVATION

How much opportunity does an aspiring workman get to observe other departments, and find out the various costs and other important details? Very little. Too few managers are trying to educate their own foremen, the common idea being that they are educating them for some other firm. This could be overcome by telling the workman in the first place what would be expected of him, telling him the expense it would entail and giving him to understand that the salary would go up as soon as he demonstrated his ability.

This would incite him to do his best and also make him studious to learn the technical parts which, no doubt, never thinking of foremanship, he had neglected. In this way enthusiasm would be stimulated and a future considered which is not apt to be the case when he is confined to one branch of work. Workmen should be given a chance at other branches and thus educated.

It would be to the manager's and em-

ployer's interest to size up and pick out the bright workmen and develop them, taking them into their confidence, pointing out their mistakes and aiding them them by helpful criticism. It would soon be apparent to them if their efforts were fruitless and they could be governed accordingly.

Let the employers educate the men and there will be no scarcity of foremen with the desired qualifications.

Newburgh, N. Y. GEO. H. HANDLEY.

Training and Education

On page 788, John E. Sweet, under the heading "The Worcester Trade School," makes some remarks on a phrase which he credits me with having said. From my knowledge of Mr. Sweet, which I have gained through his writings, I value any criticism he may make; but I beg to call his attention to the fact that if he will again refer to my article, he will see that I did not make use of the expression he quotes.

I said that to narrow, or limit, the educational course of a boy while he is still young will never make out of him a great man. My article had no concern with the manual-training school boy. I made the distinction between training and education, because I was concerned only with education. I wrote to refute the rather odd ideas which have been periodically falling from the pen of Entropy. It was, as Entropy himself says, about education in general. It might, indeed, be a strange world if everyone were educationally great; but what would it be if everyone stuck absolutely to his own trade? Someone has said that one secret of success is the early discovery that you cannot do everything. But that does not mean that you must cut yourself off entirely from everything else. A machinist's conversation with a plumber would be amusing if he knew nothing outside of the details of his own trade, and his only recreation and exercise were strapping castings on a planer. That is where the general education, and the athletics, etc., come in. The machinist with a fair general education can talk on equal terms, as I said before, with men of other trades. Those who "whoop-her-up" on the bleachers get more out of the game in the way of health and relief of tired nerves than outwardly appears. Of course, an excess of such recreation is probably worse than none at all.

I fully realize that the Worcester Trade School and similar schools are doing a praiseworthy work, and that E. H. Fish and other technical trainers have developed technical training wonderfully. But here is the question at issue: Entropy, in a number of articles ranging over several years, has directly implied that the whole present theory and practice of education is bad; the grammar-school system rotten, the high schools and colleges places to waste money and learn folly. Does anyone really believe that? Doesn't it ever occur to those few men who start out so often to revolutionize and "modernize" everything, that all men before their time may not have been fools, doing everything wrong? Entropy names some men who have risen to fame without having ever gone to school. He must remember that for every one of those, there were myriads who did nothing. Unless compelled to do so, how many boys would put in a tiny fraction of the work done by Franklin? He developed his genius only by striving unceasingly from dawn until night. Many men have lived to old age without discovering their genius. Our public schools are capable of bringing genius out in the boy if it is there. And if it is not there, they will lay a good foundation for a proper start in any phase of life.

The first radical change we ought to make in our educational system is to get rid of those men who are teaching only for the two dollars an hour which they receive, and are content with their ability to bluff the president. Of what object is a better system to them? They will only lose their positions by it. Everyone understood that the "Confessions of a College Professor" were meant as a joke, but I can find nobody who took them as such. These "lead-pipe cinches" eventually hit the participants with a sickening thud. It is easy to fool the president but impossible to delude the boys. Any instructor who is onto his job realizes that. It is this "modernizing" of schools to a system of graft that has been responsible for the poor results apparent in some European countries.

I hope I shall not be misunderstood by those men who take pride in the development of a boy's faculties. Technical training under the supervision of these competent instructors accomplishes a great work in taking the boy who does not aspire to be an engineer, and making out of him an intelligent, appreciative workman; and in teaching him also the best methods of work, which he could otherwise learn only by hard experience as an apprentice under an unwilling foreman. The engineering college is far from being above criticism, but it must not be thought that everything taught there outside of machine work is to be used only as an embellishment, or to ridicule the workman who has had no chance to obtain such advantages.

GEO. B. STUART.

So. Norwalk, Conn.

A Collection of Old Sundials

I see you have had some difficulty with the right-hand sun dial, shown on page 812, Fig. 8. The lines around the margin of the lower leaf act as a dial in the following way: Open the leaves of the dial at right angles, as shown, then adjust it as for an ordinary observation with the string gnomon (that is, set the compass to point to magnetic north) only *with this difference* that the string is on the north side away from the sun. The hour is then shown by the shadow of the edge of the upright leaf on the edge of the horizontal one. In the forenoon the hours on the right side are used, and in the afternoon those on the left, being shown by the left and right edges respectively, of the vertical leaf. At noon, obviously the whole horizontal leaf will be in shadow.

The lines on the cup dial are more involved (this dial seems to have been for Nuremberg only; it is most elaborate and a beautiful example of the work of Hans Troschel, who was a noted dial maker). There is one set of lines numbered 9, 10, 11, 12 up to 23 for the Italian hours, numbered from sunset to sunset, and also another set for the ordinary hours. It seems that in the middle ages in Nuremburg they had a very complicated system of hours. At one part of the day time was reckoned in Italian hours and at another time in ordinary hours. I fancy the lower row of figures 4, 5, 6-18 are for this Nuremburg system of hours. There is a fine specimen of a dial in the British Museum by the same maker, dated 1623, giving this system in a different form. I found this in an old book entitled "Mathesis Juvenis," 1708. Probably you noticed that this same dial has a "nocturnal*" for giving time by the stars. It can also be used as an equatorial dial by tilting up the upper leaf and using the brass plate; it also gives the moon's age and time of shining. The latter is a common thing in these nocturnals, it was based on the delightfully simple but incorrect theory that the moon rose 48 minutes later each night, so if you knew her age you had only to make the allowance for this and you got the approximate time from an ordinary sundial.

Regarding the other nocturnal, page 813, Fig. 10, a great deal of attention was formerly paid to the relative positions of the sun and moon and other bodies in the heavens. In the center plate will be seen some geometrical figures, which refer to this matter. For instance, if the sun's index be set to the current date, the sign of the Zodiac in which he is is shown also; similarly if the age of the moon be known from a calendar and the moon's index set to its age, the index shows the sign in which the moon is, and on reference to the center plate shows whether the sun and moon are in "conjunction" or "opposition" or in "trine." These "aspects" were astrological and were supposed to be beneficial or otherwise to some undertaking which you might be about to embark in.

*So said in the description. See top of first column, page 811.—ED.

At the same time a shadow appears in the round hole and gives a sort of picture of the moon's face as it appears at that age.

Toronto, Can. J. H. McDOWELL.

The Diesel Motor in America

This motor has a peculiar interest to me, and for a number of reasons. My interest in and connection with oil and gas engines dates back to beyond the World's fair in Chicago. At that time very little information on these subjects was obtainable and my trip to the fair was made to see if I could not get some practical information on the subject which would enable me to repair any such engines as should fall in my way. As time went on such engines began to be used and to venture into competition with steam engines. A few people had faith in their ultimate future as worthy competitors but almost everyone maintained that there was not anything seriously to be considered about them. Under special conditions they might be useful in small sizes but, etc., and the reasoning seemed sound. It was thus that the friends of internal combustion motors had to defend their position and prove their right to be considered seriously. Articles on the subject, both for and against, began to be common. Information that had been part of the knowledge of the scientific man found its way to the practical man. Cycles were dissected. Heat balances were worked out. The scientific man did his share in showing the possibilities and the limitations and it was up to the practical man. Sometimes the practical man followed the ideas of the scientific man and sometimes he ignored them.

One day the Diesel motor with its wonderful perfection of cycle and range of theoretical possibilities was described, and I think that I am safe in saying that no other engine either before or since received the attention that it did. Here at last was an engine that had in it the qualities that would make it supersede all other internal-combustion motors and enable it to displace the steam engine. Judging by the papers of the time the scientific men received it with open arms. Even the daily papers were full of it. In view of the lot that was said about this wonderful engine it was remarkable to see how little was said that was of use to the practical man who would like to see what such an engine looked like.

By this time I had become interested in a small way in the building of gas engines for the oil country and was naturally intensely interested in an engine that had possibilities so far beyond anything that our tests showed for the one we were building.

Being in New York city I made diligent inquiry among friends as to where I could get to see a Diesel engine. I was surprised in not being able to find any. Looking for them at the St. Louis World's Fair I did not find one in Machinery Hall but was told of one that was furnishing power for one of the shows on the Pike. After some trouble I found it. Standing at an open door I could see it running. A sign said that it was a Diesel engine. This sign gave the horsepower and the quantity of fuel per horsepower and possibly a few other items of information. A fence inside of the door prevented visitors from going in and the man in attendance did not think it any part of his business to pay any attention to visitors. This was at an exposition and I went away wondering.

I did not lie awake nights any after that wondering how soon our little engine business would have to get off from the face of the earth to make room for the Diesel motor.

One day I found myself away down near the southern part of the Gulf of Mexico and near to a fine power plant which belonged to an English firm and which consisted of five Diesel motors of 150 horsepower each. A machine shop belonging to the same company was run—part of the time—with a 35-horsepower Diesel motor. These engines were run with distillate made from Mexican crude oil. The power house was in charge of an English mechanical engineer. The engine-room attendants were native Mexicans. The fuel econmy was wonderful. This power plant belonged to an oil refinery so that the fuel was had at first cost, while coal had to be brought from England and then transported into the interior. Wood also was costly and of poor quality. I could not get a price at this place on either coal or wood. The company imported the coal it used and had the wood cut and brought in. The country is without roads. Transportation is by water. The hardwoods are valuable, being mahogony and the like, while bamboo and the fern-like palms do not make good wood for industrial purposes. As a means of comparison it might be interesting to state that firewood brought $14 per cord and coal from $16 to $22 a ton in the City of Mexico. Native labor is very cheap.

At this time the machine shop was being run by the steam engine. They had a number of duplicate parts for the other engine but found it necessary to run with the steam engine a considerable part of the time.

One of the engines in the power house was a spare one. Four of them would carry the heaviest load. Part of this load could be cut off if necessary.

Many of these things have led me to a conclusion that the Diesel motor has not succeeded better in this country because, under our conditions it does not give us cheap power. Even if it saved all of the fuel cost, there might be many cases where it would not figure out to be actually cheap power. The first cost of the equipment, the refinement of construction that must be maintained, and the theoretical knowledge and mechanical judgment and experience necessary to the man in successful charge combine to make a cost that more than offsets any economy of fuel except in very exceptional cases.

In Europe these items may have very different values for it is reasonable to suppose it does pay to use it there. In this country skilled attendance is high priced, while fuel is cheap. An engine using 15 feet of natural gas per brake-horsepower will use but $10.25 worth for a horsepower in a year of 3000 hours. The time given to such an engine, if under 50 horsepower, will seldom exceed two hours a day and will often be less. Under such conditions an engine that needs a man in constant attendance is not justified by any difference of fuel economy. In large powers the savings possible may be much greater but with these possibilities comes a more complicated design which increases the chances for trouble and shut downs which are seldom to be tolerated in important installations.

Other things being equal the engine with the best fuel economy is the most desirable engine, but only when they are equal is this sure to be true. Other things are as yet so far from being equal that the Diesel motor is not in the race in this country.

Producer gas engines furnish power for 1½ tons of coal a horsepower year and possible savings due to differences in fuel economy of different engines are easily figured. Powers have to be large before it becomes of commanding importance.

As time goes on the values of the various factors which enter into this problem may change. If that should happen, the answer to it may change.

Oil City, Penn. W. OSBORNE.

Accurate Milling Machine Work

On page 692, Mr. Melville describes a locating device for use on the milling machine. This is very good, but his idea is not new; it having been described by C. L. Goodrich in the AMERICAN MACHINIST on page 785, Part 2 of Volume 30.

This device is all right provided the piece being bored is a solid casting, but it is rather impractical on work that is cored.

Here is a method which I give for what it may be worth. A Starrett inside micrometer and base block make a hight gage which is set the hight the center of the hole to be bored is above the milling-machine table, plus half the diameter of the spindle arbor. With the indicator mounted on a surface gage a reading is taken across the top of the hight gage.

It is now an easy matter to raise or lower the table until a reading across the top of the spindle arbor corresponds to that taken over the hight gage. Or if the spindle runs out, take an average of the high and low reading.

A Brown & Sharpe hight gage may be used in a similar manner, but they are not plentiful in most shops. The greatest objection to this method is that it requires considerable care, and it is not well adapted to measurements other than hights *above* the machine table.

Another method I have used for locating holes where *great* accuracy was not necessary:

After facing a short piece of round stock, copper it and chuck it on the spindle, then with a surface gage or hight gage set to the hight desired, scribe a line across the coppered surface, turn the spindle half way around and scribe a second line parallel with the first. Raise or lower the table until the scribing point is half way between these two lines and repeat the operation. With two or three trials the adjustment can be brought so as to "split the line" and if done under a glass it will be close enough for any ordinary work.

With *any* locating method on the milling machine, it should be remembered that all adjustments must be the same while boring the work that they are while setting, for tightening or loosening the clamps ever so little will change the readings.

Where there is much jig work for the milling machine, verniers for the vertical and longitudinal slides are a paying investment, for with them it is not necessary to depend on the accuracy of the screws, and there is no chance for accumulated error. Any of the milling-machine builders will apply them at slight additional cost. It is not necessary to save very many hours of a toolmaker's time to pay for the verniers, yet, how many readers ever saw a milling machine so equipped?

They are scarcer than the proverbial hen's teeth.

Beloit, Wis. M. E. HOAG.

More Short Calculation Methods

On page 570 a method of squaring a number ending in a half is given. I beg the favor of supplementing the information given by a few "dodges" of my own which will be found equally useful in the shops and the drawing office.

By the same process alluded to, the squares of numbers ending in a quarter may be just as easily obtained; as, to find the square of 4¼, multiply 4 by 4½, and add 1/16. Thus: $4 \times 4\frac{1}{2} = 18$; add $1/16 = 18\ 1/16$.

I find, also, the following method very useful, for quickly and mentally multiplying together such numbers as 13 and 14, 13 and 15, 16 and 17, 17 and17, 18 and 19. Add the units of one number (it does not matter which number) to the whole of the other number, then add a nought, multiply both units together and add this to the number already found.

For example: to multiply 13 by 14; then, $13+4$ (or $14+3$) $= 17$; add a nought $= 170$; multiply together both units (the 3 and the 4) $= 12$; add the 12 to the 170, and the result is 182.

Again: Multiply 18 by 19; then $18+9$ (or $19+8$) $=27$; add a nought, giving 270; multiply together the units 8 and 9, giving 72; add 72 to the number 270 already found, and the obvious result is 342.

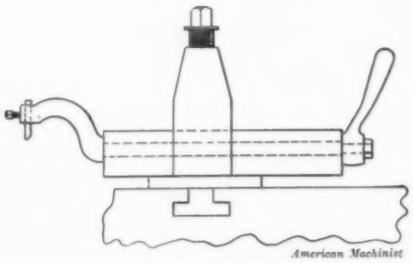
We may go still farther and easily square such a number as 16½, by using a combination of both methods. To do this quickly, we may multiply 17 by 16 and add ¼; thus, $17+6$ (or $16+7$) $=23$; add a nought, giving 230; multiply together the 7 and the 6, giving 42; add this to the 230, giving 272; add ¼, and the answer is 272¼. Further, to square such a number, mentally, as 16¼, simply proceed as before, multiplying 16 by 16½, and adding 1/16.

J. T. TOWLSON.

Silverton, London, E.

A Ball Turning Device

W. C. Dixon has given, on page 267, probably the best way for turning a ball; that is, for manufacturing, but I think in a repair or jobbing shop, a tool like that would be rather expensive, because a new cutter would have to be made for every size.



BALL-TURNING DEVICE

In the accompanying sketch is a tool that I think will be of use to some. It is so simple that it needs no explanation, except that the center of the hole in the body must be as nearly in line with the lathe centers as possible. I have been using it on a good many jobs with good results. I rough it down first, getting it as near as I can, and then finish it up with this tool.

C. A. SIEWECK.

Poughkeepsie, N. Y.

Jig Bushing with Close Centers

On page 742, Eli Allison holds me up to ridicule for my letter describing a jig bushing with close centers. His letter shows him as somewhat of a satirist, but viewed from a mechanical standpoint he evidently has not yet arrived.

In the first paragraph he says that I claim to have accomplished the same ends by a much simpler route. This I certainly have done. The second paragraph states that he admits that, proximity of the holes alone considered, my method suffices, but from a viewpoint of accuracy it is hopelessly inadequate. In reply to this I wish to state that the bushing recorded on page 457 was offered as a substitute because it would answer the requirements for practically all jig work met with in 20 years of experience.

My friend next accuses me of concealing the method by which I am assured of accuracy to 0.0001 inch. Now, if he had read my letter correctly, he would have known that no reference whatever was made to 0.0001 inch. He then goes on to say that I proceed to beg the question entirely, by assuming that a drill 0.040 inch in diameter will keep unswervingly true through 0.5 inch of stock, and that every toolmaker knows that such a drill will deviate more or less from its true direction in ninety-nine cases out of a hundred. Drills, as commonly employed, will deviate enough to spoil the work, but it was clearly stated that an open tailstock was used, and as proof of its possibilities, I have the bushing under consideration in my possession. The two outside holes were drilled parallel to within 0.00025 inch, and the middle hole with either of the two outside holes to within 0.0005 inch. The actual time consumed in drilling was 28 minutes.

If your correspondent cannot do as well as this and wants a better guarantee of accuracy, I would suggest that he drill and bore the holes about 0.002 inch small, half way through if he wishes. Then drive a plug in the solder chuck, turn down to size required, slip the work on and against the face of chuck, clamp the work; then drill and bore the other half. After hardening the bushing, the outside surfaces may be ground and lapped. Then, clamping the work to the anvil, the holes may be ground with a diamond lap nearly to size, finishing with wire lap, and the center distances can be obtained as described, thus insuring a high degree of accuracy.

Elgin, Ill. GUS HAESSLER.

Gilding on steel can be imitated by galvanic coating with copper from a cyanide bath and then with zinc. The zinc film must be very thin. After drying and polishing, the article is heated in linseed oil to 160 degrees Centigrade.

Modern Grinding Methods*

By B. M. W. Hanson †

Development of surface grinding with a cup wheel until it has taken a foremost place in grinding methods.

Examples of work done.

*Presented before the American Society of Mechanical Engineers' annual meeting.

†Works manager, Pratt & Whitney Company.

The grinding machines now used can be divided into two large groups; machines for cylindrical grinding and machines for grinding flat surfaces. Cylindrical grinders are well known and have been highly developed by four machine-tool builders in this country. The other style of grinder, the surface grinder, is best known as a planer-type machine, with a wheel grinding on its periphery, and fed across the surface in much the same manner as a tool is fed across the surface on a planer or shaper. Another type is the vertical surface grinder with a cup-shaped wheel working in much the same manner as an end mill on a vertical milling machine.

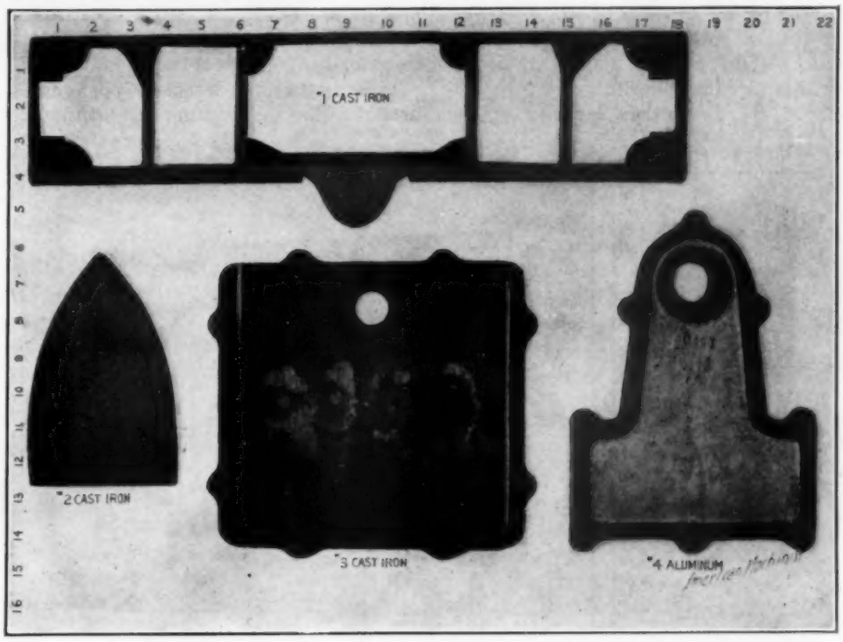


FIG. 1. EXAMPLES: NO. 1, CAST IRON, 15 TO 20 PER HOUR; NO. 2, CAST IRON, 60 PER HOUR; NO. 3, CAST IRON, 25 PER HOUR; NO. 4, ALUMINUM, 30 PER HOUR

In doing work on lathes or milling machines, it is comparatively easy to reproduce several pieces to the same dimensions by adjusting the machine to a size. This is possible because the reducing member, which is the turning tool, will resist wear for a considerable length of time without making any difference in the size of work. With grinding machinery this is more difficult, since the reducing member is constantly wearing away at a rapid rate. For very close work it is necessary to readjust the machine for every piece to be ground, which, of course, requires skill and time.

Devices now used control the size of the work, no matter how much the reducing members wear away. When the work has reached the desired size, which can be predetermined by suitable adjustments, the machine will automatically throw out the feed and new pieces can be put in, one after another, and these will be automatically ground to practically the same diameter, say within one-quarter of a thousandth of an inch.

It will easily be seen that an operator can manipulate more than one of these machines and that by their use less skill is required to get uniformity of size. In this design the size of the work is controlled by contact with the work itself, which is the preferable way, but the same results could be obtained by contact with the reducing member. This, however, would be more difficult because of the coarseness of the reducing member and its ability to wear away the contact point faster than does the work.

SURFACE GRINDERS

As said above, surface grinders have usually been made with the wheel grinding on its periphery and in some instances it may be necessary to continue to do work on this principle, as grooves and irregular shapes sometimes have to be ground and the thinness of the wheel makes it possible to get into narrow places; but when flat surfaces are wanted, the cup-shaped wheel has taken a foremost place in grinding. The wheel covers the whole width of the work at once and water is foced through the center of the spindle, centrifugal force throwing the water outward and compelling it to pass between the work and the wheel. It is astonishing with what rapidity work can be reduced to a flat surface under this process.

This method of grinding would never have been successful if it had not been for the advancement in wheel making. The wheel problem in connection with the machine has been most difficult. It has

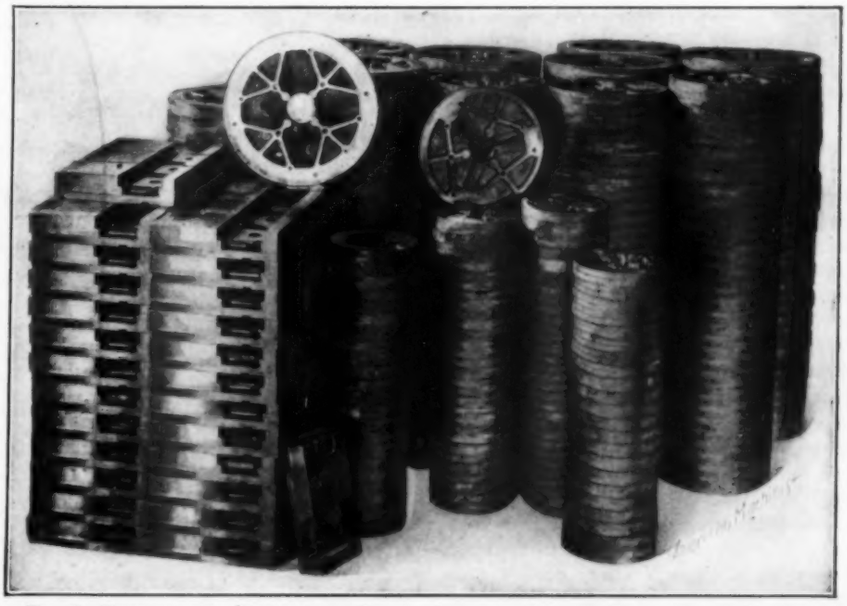


FIG. 2. EXAMPLES OF GRINDING: CHUCK PLATES, GROUND BOTH SIDES, 6-INCH 20 PER HOUR; 9-INCH 15 PER HOUR; 12-INCH 10 PER HOUR; VISES, GROUND ON TWO EDGES, TOP AND ONE CLEANED ONLY, 20 PER HOUR

been found very essential to select the right kind of wheel for different classes of work and for different materials. For grinding steel, either hardened or soft, corundum wheels have proved the best and for grinding cast iron the carborundum wheel has proved the best. The different degrees of hardness must be taken into consideration when the width of the surfaces to be ground varies.

The makers have decided to place on the market a much larger machine of this type than they have made before. This machine has a table stroke of 6 feet and can grind a piece 6 feet long and about 25 inches wide. It can also grind circular rings and disk surfaces up to 30 inches in diameter. The wheel has a diameter of 30 inches and the whole machine is driven from a single belt by a 40-horsepower motor. As this machine has recently been built, its capability is not fully known, but for work that has already been tried, it shows very encouraging results. For such work as grinding guide bars, slide valves and link motions for locomotives, large stamping dies such as are used in electric works, facing automobile cylinders and automobile-engine frames, I believe it will show its superiority over any other method by several hundred per cent. In one of the trials, a surface of cast iron, 6 feet long and 20 inches wide was reduced in thickness 0.01 inch in five minutes, leaving an excellent finish and an exact flatness. In fact when tested no point in the surface showed out of true more than 0.0005 inch. In grinding steel this type of surface grinder produces chips that look very much like metallic wool, which seems to indicate that when a cupped wheel passes over the work the chips are made by the outer edge of the wheel in the same manner as chips produced by the outer edge of an end-milling cutter. If the chips were made underneath the broad contact surface of the wheel there would not be room for them to curl up in the small places which are left between each cutting particle of the grinding wheel. The large surface in contact with the work simply smooths the surface.

The table on these machines is provided with different feeds. It is difficult to make an exact rule as to what feeds to use for different materials, but the operator can determine this by running the machine a few minutes. The difficulty lies in the fact that wheels supposed to be made of the same specifications, vary considerably and consequently the feed has to be regulated not only to suit the material being ground but also to suit the cutting ability of the wheel to be used. At the present time it is safe to say that grinding machinery is fully developed to the cutting capacity of the wheels and there will probably not be any essential changes until the grinding wheels have reached a higher development.

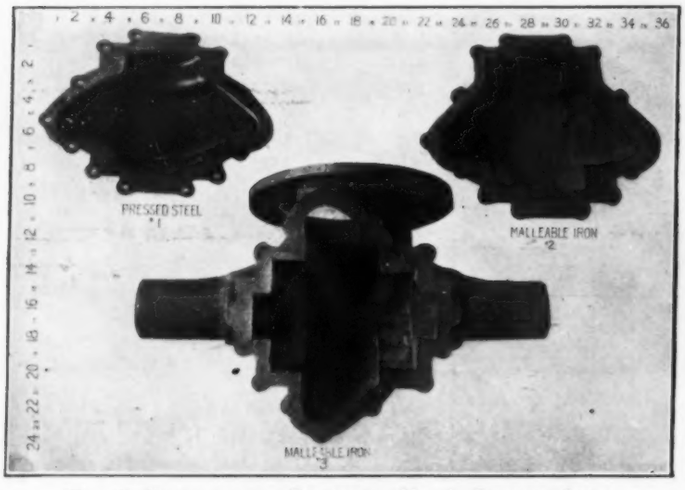


FIG. 3. EXAMPLES OF GRINDING: NO. 1, PRESSED STEEL, 15 PER HOUR; NO. 2, MALLEABLE IRON, 15 PER HOUR; NO. 3, MALLEABLE IRON, 12 PER HOUR

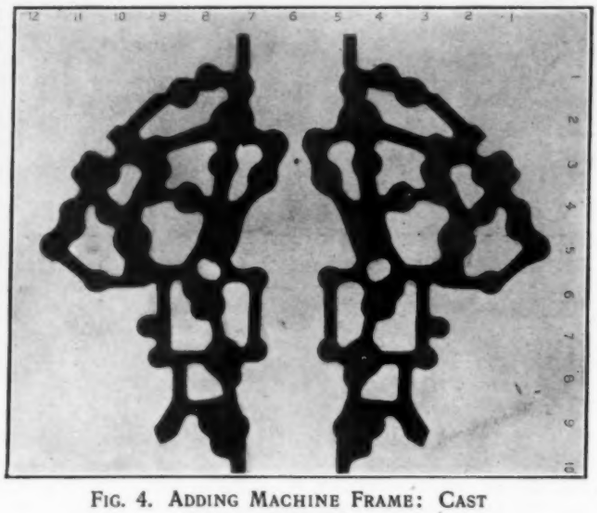


FIG. 4. ADDING MACHINE FRAME: CAST IRON, 15 PER HOUR

EXAMPLES OF WORK DONE

In Figs. 1 to 4 several photographs are reproduced of work which has been ground on vertical cupped-wheel machines. In some instances, such as in the production of small gun parts, like hammers and triggers, the work has been done from 15 to 20 times faster than it can be milled, and it has a smoother and more accurate surface. This is especially true where the surfaces are not too wide.

To give an idea of the capacity of a grinding machine having a cupped wheel for grinding flat surfaces, compared with a grinding machine having a wheel grinding on its periphery and working on the principle of a planer, it is worth while to note the following:

The traversing speed of the work or the work table can be assumed to be the same. If a piece is 6 inches long and 3 inches wide, the machine grinding on its periphery will take about 48 strokes to cover the surface, assuming 1/16 inch feed for each stroke. The cupped-wheel machine will do the same amount of work with one stroke or in about 1/24 the time. These proportions are essentially true on hardened steel or on any kind of work where a nice finish is required.

Furnace for Heating Wheel Tires

Dr. Jos. Pfeil, in *Annalen für Gewerbe und Bauwesen*, Berlin, 1910, describes a combined gas producer and heating furnace for heating wheel tires.

It is stated that wherever coal gas is available for the preliminary heating of tires, before they are pressed on to railway-car wheels, it is employed for this purpose, but that its use is costly, while the operation takes considerable time. In the absence of gas it is necessary to have recourse to various primitive devices, which are unsatisfactory, because it is difficult to insure that the tire becomes heated throughout to the same temperature. A description is given of a heating furnace, combined with a gas producer, devised by the author, which, in addition to being economical in working, insures the uniform heating of the tire in all parts. The gas producer enables the requisite gas to be generated from cheap and refuse coal, and while the lower part of the furnace contains the gas producer, the upper part is formed as a heating chamber. By this compact arrangement the entire calorific value of the fuel is utilized and the gases are consumed in their hottest form by the suitable admission of air.

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American Machinist

Editorial

Increasing Rates or Reducing Costs

The hearing before the Interstate Commerce Commission in regard to the necessity of transportation rates being raised by the various railroads is bringing out an important point that might be well considered by every manager in any manufacturing industry, as well as by those connected with the railroads. It is unfortunately true that the railroads of this country have grown up with the idea that they were a law unto themselves and they have conducted many of their operations without regard to what has been done in other industries in the way of effecting economy.

No one who is familiar with railroad development can refrain from admiring much of the enterprise that has been displayed and the results which have been accomplished. But no matter how dazzling these may have been, we should not be blinded to the fact that many wasteful practices have been and are still sanctioned by some of the best railroads in the country.

It is but natural that a railroad manager should resent the assertion by those who are not connected with railroading, that they might save thousands of dollars a day, and yet the real reason for this resentment is very likely to be the knowledge that part, at least, of this criticism is true.

Railroad shops were for many years more or less a joke, as compared with the average manufacturing establishments, due partly to the difference in the work to be done, but very largely because modern methods were overlooked in too many cases. Some of these have now been modernized to such an extent that many manufacturing plants can find methods and economies which they would do well to copy. This has been shown in many of the articles from railroad shops, published in the AMERICAN MACHINIST during the past six months, which show refinements in manufacture and attention to details which was unknown 10 or 15 years ago.

It is not our intention, however, to instruct the railroads how to run their business, but to call attention to the tendency toward the doubtful expedient of meeting every new expenditure by a raise in rates, instead of an attempt to effect economies of operations, which would ultimately work for the good of the service.

This applies to any manufacturing establishment as well as to railroads, and many managers are already looking along this line as a means of maintaining profits in the face of increased operating expenses.

In the minds of too many managers there are but two ways of increasing profits, or of maintaining them in the face of an advance in the material. These are the advancing of the selling price, or the reduction of wages. But among the most progressive managers we know of, neither of these is considered until after every legitimate means of reducing the cost of manufacture has been gone over.

With an efficient shop organization and a hearty coöperation between the different departments, surprising savings can often be made by the adoption of new methods, so that advances in the selling price become unnecessary as a means of maintaining the normal profits. Shops of this kind are also well aware that a wage reduction very seldom has the effect in this respect, as in many lines of work, the amount saved by this is a comparatively small percentage of the total manufacturing cost of the article in question.

Whether the advance in railroad rates is allowed to stand or not it is to be hoped that the railway managers will heed some of the suggestions offered as to the way in which expenses may be reduced and that other manufacturers throughout the country may feel that they also apply to them.

Although most of the criticism has been directed against the railroad shops, there is good reason for believing that this is not the most delinquent department, but that the design, construction and operation of the motive power, as now being used, is in many cases more wasteful than the average railroad shop. The shops are becoming more economical while the reverse seems to be true of the development in motive power during the past few years.

Legislation Relating to Industrial Education

The most recent bulletin (No. 12) of the National Society for the Promotion of Industrial Education has the title: "Legislation upon Industrial Education in the United States," and is at once a use-

ful résumé of the present legislative status of the movement and an exhibit of the progress which it has made.

From it we learn that of the 46 States of the Union, 29 have passed laws favorable to some measure of activity in industrial education. Of these, 25 have enacted their present provisions since 1900, and of the 11 which have provided for industrial and trade training, as distinguished from practical activities of a more general sort, all have enacted their provisions since 1902. The first State commission (that of Massachusetts) for the study of industrial and technical education, in whose wake more than a half dozen others have followed, was not appointed until 1905. In the words of the pamphlet, "no other educational movement calling for large expenditures and involving sweeping changes in curriculum and method has received such prompt legislative recognition as has the demand for practical and trade training."

The States which have made the most noteworthy provisions for the establishment of industrial and trade schools are Massachusetts, New York, Connecticut and Wisconsin, and of these Massachusetts, New York and Connecticut have provided for and have established subsidized or State-aided schools, while Ohio alone has enacted a statute providing for compulsory part time, or continuation-school work.

The Ohio statute is, however, only remotely, if at all, industrial, as it does not require the continuation-school work to be of an industrial character. It contains two provisions, one of which extends the compulsory full time school age, in the case of those not regularly employed, to 16, while the other provides continuation-school work for those who are regularly employed, but who have not completed satisfactorily the school work which is scheduled for completion at the age of 14.

The pamphlet from which our information is drawn contains a codification of the Massachusetts statutes, and the full text of the New York and Wisconsin statutes. Along with this and much other information is a tabulated comparative exhibit of the legislation in Massachusetts, New York, Connecticut, Wisconsin, Ohio and New Jersey, as regards the control of the schools, the source of the initiative from which their foundation must come, their support, type, conditions of admission, relationship to regular public schools, and other features. To many it will be a surprise to learn the extent to which industrial education has been noticed and made the subject of legislative action.

It will be seen that the pamphlet is of distinct usefulness to those engaged in the furtherance of this movement. It may, we understand, be obtained from the office of the secretary of the society, which is located at 20 West 44th street, this city.

New Publications

PHYSICS. By Charles R. Mann and George R. Twiss. 424 5¼x7½-inch pages with 220 illustrations. Revised edition. Scott Foresman & Co., Chicago and New York.

There could be no better illustration of the movement away from the abstract and toward the concrete in education than is afforded by this text book. One can scarcely open it without finding a reference to some fact of every-day experience or observation, used either as an introduction to a subject, or as an illustration of a physical law. In addition to this is a note of personal familiarity and appeal as far as possible removed from the formal and didactic style customary in such books. The text is thoroughly readable and interesting and can scarcely fail to hold the attention of a student having any sympathy with the subject.

A knowledge of physics underlies all sound education of an industrial character. The branch called mechanics, especially, underlies all mechanical education. A knowledge of force, work, motion and heat is essential to the understanding of much that goes on in the machine shop, and it is the adaptability of the volume to the work of industrial and trade schools that leads us in this case to depart from our custom of not reviewing school text books.

Personals*

A. H. Bullard, treasurer of the Bullard Machine Tool Company returned home on December 10 after a six weeks successful business trip in Europe.

C. B. Kirkham, formerly general manager of the Kirkham Motor Company, Bath, N. Y., has become a member of the Kirkham-Eells Aëroplane Company, Bath N. Y.

J. L. Wallach is requested to communicate with Jacob M. Blake, 684 Mills Building, San Francisco, in order to obtain some important information to his benefit.

Samuel T. Mudge, until recently an instructor at the University of Michigan, has become superintendent of the Rogers Paper Manufacturing Company, South Manchester, Conn.

John A. Dent, recently with the oil-pipe line service of the New York Transit Company, has been appointed instructor in mechanical engineering at the University of Illinois.

J. Howard Hayes, who was a partner in the F. H. Hayes Machinery Company, Boston, Mass., has become connected with the turbine department of the Platt Iron Works Company, Dayton, Ohio.

*Items for this column are solicited.

H. B. Dirks, instructor in mechanical engineering at the University of Illinois, has resigned to accept position as assistant to the general manager of the National Machinery Company, Chicago, Illinois.

J. A. Anderson, lately superintendent of the Sageng Threshing Machine Company, St. Paul, Minn., has accepted a similar position with the Russell Grader Manufacturing Company, of the same city.

Frank Salomon, formerly chief engineer of Alfred H. Schütte, with headquarters at Cologne, Germany, has accepted an important position with the Otto Gas Engine Works, Philadelphia, Penn.

Ralph A. Gleason, formerly consulting engineer and appraiser for Marwick, Mitchell & Co., New York City, has recently been appointed factory manager for the R. Bliss Manufacturing Company, Pawtucket, R. I.

F. G. Bolles, commercial engineer of the Allis-Chalmers Company, has resigned in order to devote his entire attention to the Reliance Engineering and Equipment Company, Milwaukee, in which he has an interest.

J. G. Vincent, for several years superintendent of inventions of the Burroughs Adding Machine Company, Detroit, Mich., has resigned his position in order to take up engineering work for the Hudson Motor Car Company of the same city.

Frederick H. Keyes, who was formerly general manager of the Robb-Mumford Boiler Company, has established an office as consulting engineer, at 88 Broad street, Boston, Mass., with T. D. Sprague and Henry D. Jackson as associates.

J. J. Lawlor and Edward Harmes who recently resigned from the Hermann Molding Machine Company, have formed the Lawlor Improved Jarring Molding Machine Company with headquarters in the Century Building, Pittsburg, Penn.

J. A. Bennett, who has been connected for the past two years with the Lodge & Shipley Machine Tool Company, Cincinnati, Ohio, as mechanical engineer, has accepted the position of chief engineer of Studebaker Brothers Manufacturing Company, South Bend, Indiana.

Charles J. de Berard

Charles J. de Berard died at his home in Norwood Park, Chicago, November 28, 1910.

Mr. de Berard was for the past 25 years associated with Robert Tarrant in the machine-shop business, and at the time of his death was a director in the Tarrant Foundry Company, as well as secretary and treasurer of the Felt & Tarrant Manufacturing Company, both of Chicago. He was a native of Racine, Wis., having been born in 1849, and is survived by his widow, three daughters and two sons.

New Tools and Shop Appliances

A 24-inch Heavy Duty Crank Shaper

The halftone shows a new crank shaper which is being put on the market by C. S. Dodge, Lowell, Mass.

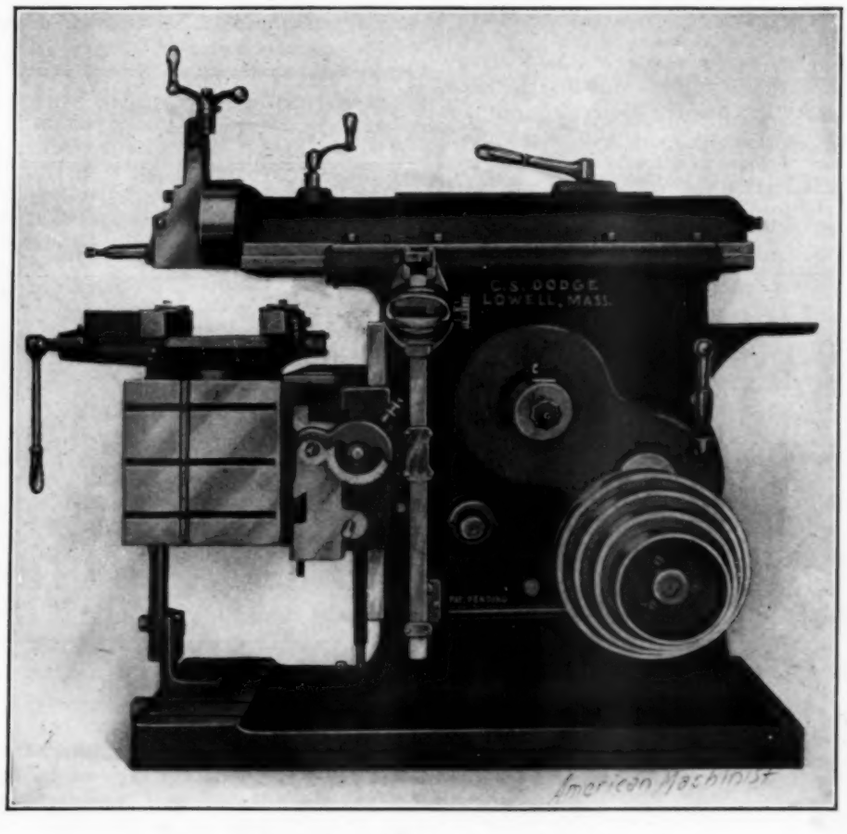
The ram guides are V-shaped, insuring accurate alinement. The method of holding the ram overcomes any tendency to spread the frame or buckle the ram when roughing or taking heavy side cuts, the strain of roughing being taken by flat straps. The ram is actuated by a back-geared crank with quick return. The stroke can be instantly changed while the machine is in motion or at rest, and the length of stroke at which the machine is set is indicated on a stationary index. The position of the ram can be altered either while the machine is at rest or in motion.

The head swivels to any angle, and the feed screw is provided with a micrometer dial reading to thousandths.

The table is of box form and may be swiveled through 360 degrees so that any side of it may be used as the working surface. It can also be readily removed and the work secured to the apron. All T-slots are cut.

ANY and all new or improved machines, tools, or shop appliances of interest to men responsible for results in machinery-making plants will be briefly illustrated and described here—the machine shop news.

A more full and detailed description will be given—when it is real news—if it can appear here first—before it is sent to other papers. All descriptions appear in ALL four editions of the paper—Weekly, Monthly, Weekly English and Weekly German.



24-INCH HEAVY-DUTY CRANK SHAPER

The base has an extension, as shown, and is provided with a support for the outboard end of the table.

The cross feed works in either direction, adjusts itself automatically as the table is raised or lowered, stops automatically at each end of the table traverse and the screw is provided with micrometer dial reading to thousandths.

The vise is graduated, swivels to any angle and when holding work the screw is under tension which relieves the body of the vise from strains. Its jaws are of high-grade tool steel.

Shafts up to 4 inches diameter may be passed under the ram for keyseating, etc.

Three Wire Generator

The Triumph Electric Company, of Cincinnati, Ohio, is putting upon the market a new design of three-wire generator, the principal claim for which is said to be the elimination of sparking on unbalanced load. These machines may be furnished for either belt drive or direct connection to any standard engine. Standard machines are designed to take care of an unbalanced load of 25 per cent. Other capacities may be obtained, however, when desired. They are built in all standard sizes from 25 kilowatt up and are wound for 250 volts, so that 125 volts may be obtained from either side of the three-wire system. They are suitable for parallel operation, and may also be operated in connection with two-wire machines, when so desired. The balancing coils supplied with these generators consist of three inter-connected windings upon laminated iron cores suitably mounted in cast-iron case.

A New Roller Bearing

The halftone shows a roller bearing which is being put on the market by the

NEW ROLLER BEARING WITH CAP REMOVED

New York Oilless Bearing Company, 127-129 White street, New York.

While the cut shows it applied to a shaft-hanger box, it is made to cover a wide range of special requirements, such as high speeds, absence of oil, high temperatures, etc.

The mechanism is an adaptation of the principle of the barn-door hanger to a rotating instead of a sliding member.

The rollers *A* roll on the shaft *E* and have projections *B* on each side, which roll on the runways *C*. They are held in position by the spacing rings *D*, which are held by rivets in proper relation to each other. The spacing rings *D* are made in halves so that the roller bearings may be applied to shafts already installed. Except for the slight sliding friction of the pins *B* in the slots in the spacers *D*, the contacts between the shaft *E* and the roller *A* and the runways *C* and pins *B* are all rolling contacts.

Horizontal Boring, Drilling and Milling Machine

In the accompanying illustration is shown a horizontal boring, drilling and milling machine, now being manufactured by the Franklin Machinery Company, of Franklin, Penn. An overhead steady bar is provided, which may be used in any of the operations when a long span is required. The control is centralized; all levers for changes of speed and feed, starting and reversing, being conveniently located for the operator from his usual position. The drive is of the all-geared type, giving 12 speed changes and 6 changes of feed, with steel gears and steel clutches, and friction adjustable from the outside of drive box. All of the drive and feed gearing is immersed in oil. The automatic feed applies to the boring bar, table (both directions), boring-bar saddle and outboard bearing. A convenient hand wheel is provided for gradual advance of the various feed-operated parts. Some of the dimensions of this machine are as follows: Elevation of bar from table, 36 inches; continuous feed on bar, 36 inches; horizontal capacity, 72 inches; diameter of spindle, 4½ inches; Morse No. 6 taper hole in spindle; table working surface, 24x48 inches; feeds to one turn of spindle, 0.007 to 0.250 inch; floor space, 10x19 feet.

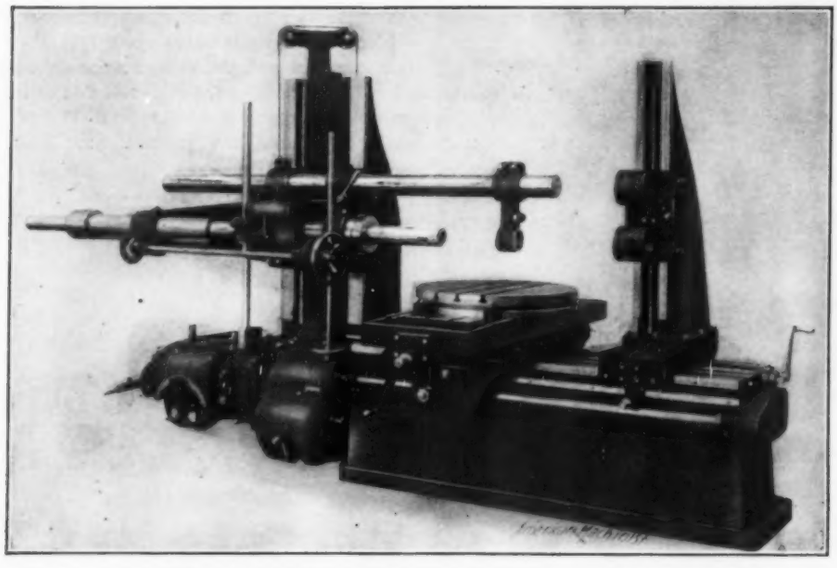


FIG. 1. FRANKLIN HORIZONTAL BORING, DRILLING AND MILLING MACHINE

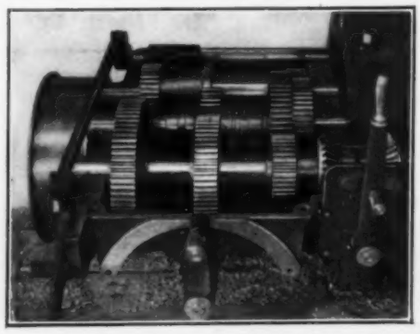


FIG. 2. GEAR BOX

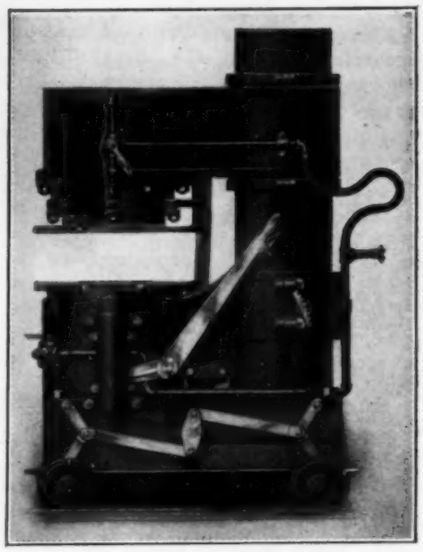
A New Brazing Compound

The Phillips-Laffitte Company, Pennsylvania building, Philadelphia, Penn., is placing on the market a new French brazing compound, which combines all the ingredients necessary to complete a braze.

It is in the shape of three distinct compositions: No. 1 for brazing brass, copper and bronze; No. 2 for copper and iron, and No. 3 for iron and steel. Each one of these compounds will fuse at a considerably lower heat than the metal it is intended to braze.

A New Molding Machine

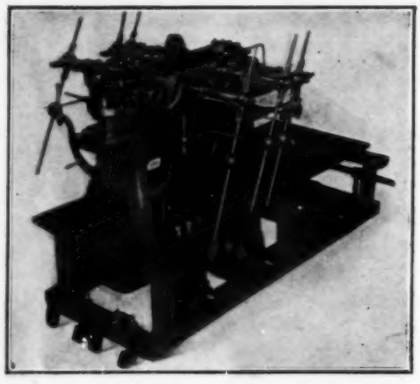
The halftone shows the Lawlor movable combined jarring and squeezing machine built by the Union Foundry and Machine Company, Pittsburg, Penn. This machine is adapted for making light castings, such as are made in snap flasks, as well as deep and heavy castings that cannot be squeezed, but can be jarred upon this same machine. Pushing back the squeezing head converts it into a jarring machine for ramming deep molds, also for stripping plate work.



LAWLOR MOVABLE COMBINED JARRING AND SQUEEZING MACHINE

A German Six Spindle Spline Miller

The halftone shows a spline miller built by the Maschinenfabrik Gebrüder Sucker, Grunberg, Schlesien, Germany.

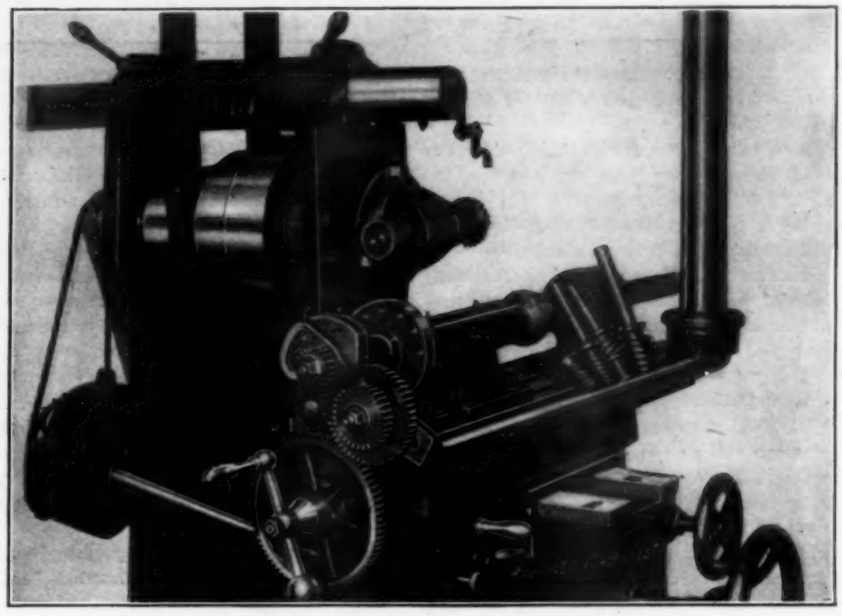


A SIX-SPINDLE GERMAN MILLING MACHINE

The miller shown has six spindles and was designed for milling keyways in the drawbars of railway cars. The tools used are of the two-lip type and are made of square-section high-speed steel.

The Garvin Thread Milling Attachment

The halftone shows a milling machine built by the Garvin Machine Company, New York, equipped with its new thread-milling attachment. With this device single and multiple threads within a wide range may be rapidly and easily cut.



THREAD-MILLING ATTACHMENT ON PLAIN MILLING MACHINE

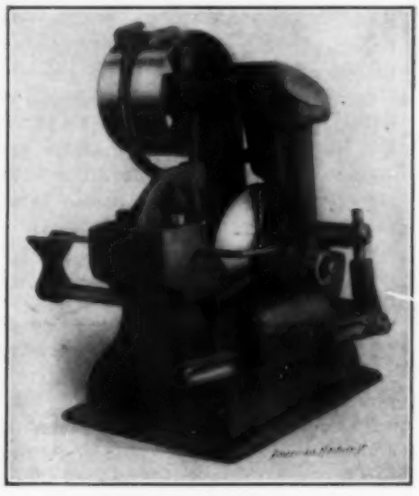
The spindle of the attachment runs in a long rigid bearing mounted on the table of the machine. The drive for the attachment spindle is from the milling-machine spindle through sprocket and chain drive to the Garvin gear box at the back of the machine. From thence it is through the usual universal joints and shaft to the table screw.

Such work as milling machine and lathe spindles are forced on the taper nose of the attachment and supported by the adjustable steady rest, shown to the extreme right of the table. The work shown in place in the attachment, is a milling-machine spindle. The nose of this is 2½ inches in diameter, ¾ inch long, 4 threads per inch and the machining time is 7½ minutes. The long spindle standing on end is 5 inches in diameter, 1⅜ inches long and 4 threads per inch and the time on this job is 22 minutes.

Metal Sawing Machine

The machine shown in the halftone is built by the Taylor-Shantz Company, Rochester, N. Y. It was described in this paper about a year ago but since then has been considerably improved throughout, making it heavier, more rigid and convenient, the saw has been increased in size and the drive made more powerful.

The machine is intended to meet the demand for an accurate and rapid cutting-off tool for light work. It will cut flat stock 4½x1¼; rounds up to 2⅜ and squares up to 2 inches. The drive is through cut bevel gears and a 3-pitch triple-thread worm, provided with ball thrust, to a hobbed worm wheel on the saw spindle. All steel parts, subject to wear, are pack hardened.



METAL-SAWING MACHINE

The feed is by gravity, the weight at the right being adjustable to suit conditions. The vise is of the V-block pattern with clamping screw. The saw arbor is hardened and runs in adjustable taper bearings. The saw is made of semi-high-speed steel 8 inches diameter by 5/64 inch thick with relief from rim to center and runs in an oil bath.

An adjustable gage is provided for duplicating. The machine occupies a space 22 inches square over all.

Mechanical Engineers' Annual Meeting

Editorial Correspondence

The thirty-first annual meeting largely attended and conspicuously successful, combining professional interest and social functions.

A number of papers presented on a variety of interesting subjects; machine shop session given over to the subject of grinding.

The opening session of the annual convention of the American Society of Mechanical Engineers was held on Tuesday evening, December 6, and in addition to the general renewal of acquaintances which makes these meetings so enjoyable, the address of the retiring president, George Westinghouse, consisted of a very interesting account of the conception and development of the air brake, which has come to be universally recognized as one of the essentials of modern railroading.

At the conclusion of Mr. Westinghouse's speech, the election of officers for the ensuing year was announced as follows: Col. E. D. Meier, president; H. H. Vaughn, E. M. Herr, George M. Brill, vise-presidents; D. F. Crawford, E. B. Katte, Stanley G. Flagg, Jr., managers; Calvin W. Rice, secretary; William H. Wiley, treasurer.

The attendance was large in spite of an extremely stormy evening.

WEDNESDAY MORNING SESSION

The first part of this session was devoted to business and the reading of various committee reports.

Prof. F. R. Hutton, honorary secretary for the joint meeting in England during the summer just past, then read a paper on the joint meeting, incidentally emphasizing the fact that the engineer of today and of the future is responsible for the safety and lives of industrial employees.

A paper by George A. Orrok was presented, dealing with "Transmission of Heat in Surface Condensation." The author develops practical formulas for the design and proportions of surface condensers. Considerable discussion followed and the general opinion was ex-

pressed that this paper dealt in a practical way with a subject hitherto but unsatisfactorily treated.

Wednesday Afternoon Session

The first paper of this session was by Edward A. Uehling, and dealt with "Combustion and Boiler Efficiency." The author's conclusion is that stack temperature and percentage of carbon dioxide are the controlling factors in the determination of boiler efficiency.

B. Viola presented a paper on the "Automatic Control of Condensing Water in Barometric Counter-current Condensers for Vacuum Pans."

Samuel L. Naphtaly, of San Francisco, Cal., gave a paper on the test of a 10,000-k.w. steam turbine. This machine running at a speed of 1800 revolutions per minute was pointed to as a step in advance in high-speed steam-turbine practice. This paper was followed by one on the test of a 9000-k.w. steam turbine, by F. H. Varney, also of San Francisco. Both of these papers gave rise to considerable discussion as to the relative merits and demerits of high-speed steam-turbine practice.

The final paper of the afternoon was entitled, "Notes on the Value of Napier's Coefficient with Superheated Steam," and was by Isaac Harter, Jr. His results are based upon a series of experiments and, among other things, show a numerical increase in the value of the coefficient corresponding with increased superheat.

Thursday Morning Session

This session opened with a paper entitled "A New Theory of Belt Driving" by a non-member, Selby Haar. The title is hardly appropriate as instead of being a new theory it is a collection of experimental data from a number of German sources particularly the results of experiments by Professor Kammerer and C. Otto Gehrckens.

The most startling feature of the paper was the prophecy of Mr. Gehrckens to the effect that 11,900 feet per minute is no limit to belt speeds at present. He also states that belt pulleys, presumably fitted with felt, have run 98,000 feet per minute, that Brown, Boveri & Co., have reached 74,000 feet per minute, while the Schuckert Company runs flywheels at 19,600 feet per minute. He said—"We are by no means close to the limit of belt speed, and the capacity of the belt does not commence to increase until high speeds are reached."

Professor Kammerer's conclusions drawn from his recent tests are thus summarized:

a The effective pull on a belt is not reduced so much by centrifugal force as the currently accepted method of calculation would lead one to expect. In other words, the maximum allowable tension in a belt apparently increases with the speed.

b The coefficient of friction increases with the speed and reaches values far above that usally assumed.

c The maximum efficiency of transmission is not limited by the speed.

d The coefficient of friction is larger for large pulleys than for smaller ones.

e A wooden pulley has a higher coefficient of friction than an iron one, at least when new.

f Transmission is more efficient, and the coefficient is higher when the smaller pulley drives.

g A belt operates with higher efficiency and usually with less creep when the tight side is on the bottom.

h A properly placed idler improves the efficiency of transmission.

i The neutral layer is systematically located in the belt so that the effective diameter is the sum of the pulley diameter and the thickness of the belt.

j At any speed the sum of initial tension and centrifugal force is constant.

Mr. Haar then discusses these conclusions in the light of experimental work done by several other European experimenters, and the work of Professor Bird and Mr. Barth, who have presented papers on the subject of belting to the American Society of Mechanical Engineers. A few of the points brought out are: The efficiency, which should be understood to include the losses in the belt only, was the same at 5200 feet per minute as at half speed in a certain test. The value 0.98 was reached in each case, but naturally not at the same load.

American practice also calls for the tight sides of belt on the bottom, but the idler is usually not favored.

Professor Kammerer found that the sum of the initial tension and centrifugal force is constant. This means as the speed increases the initial tension is replaced by tension due to centrifugal force. As the centrifugal strength is absorbed in the belt, and produces no bearing pressure, the increase in speed causes a decrease in bearing pressure.

This paper brought out some extremely interesting discussion by Messrs. Barth, Van Derhoef, Nagle, Emerson, Taylor, Kent, Phetteplace and Rockwood, all of whom entirely disagreed with the author of the paper as to the advisability of extremely high belt speeds. Mr. Van Derhoef told of decreasing the slack side tension and increasing the arc of contact by the use of large diameter idlers, and of an experiment by the Dodge Manufacturing Company, in which a 46-inch pulley, having iron hubs and arms, but fitted with a wooden rim, was run at a rim speed of 28,889 feet per minute.

Both Mr. Barth and Mr. Taylor called attention to the fact that belt efficiency was not nearly as important a factor as many considered, as both the first cost and the maintenance were insignificant as compared with the loss that is often occasioned by the machine being thrown out of commission. All conceded that it was much better to run belting under 5000 feet per minute in all cases except for main drives, and that in many cases there was greater economy in not exceeding 4000 feet per minute, even at the loss of belt efficiency, owing to the fewer delays than where belts were strained too tight and run too fast.

A paper on "A Graphical Method for Calculating Stresses in a Connecting Rod" was presented by W. H. Herschel and showed a method of avoiding the assumptions generally made in calculating stresses of this kind by analytical formula, and proposed a graphical method for finding the stress at any point of a rod of any shape. Examples were given, showing that in a simple shaft of uniform stress the maximum bending moment and maximum diameter will be less than 0.6 the length of the rod from the crosshead end, and the maximum bending moment at any one point will occur at about 38 per cent. of the stroke. The stresses are said to be much greater than given by the usual formula, mainly on account of considering the bending moment, due to axial thrusts.

The next paper was "Operating Conditions of Passenger Elevators," by Reginald Pelham Bolton. The author directs attention to the effect upon elevator work and economy of passenger movement and traffic by reducing the period of actual motion and increasing the time occupied in the operations of starting and stopping. The author divides the service of an elevator into two elements, passenger time, during which the apparatus is idle, and machine time, during which the apparatus is in motion, and suggests that inefficiency results from an undue proportion of either element.

Following this came a paper on "Modern Shoe Manufacture," by M. B. Kaven and J. B. Hadaway. This paper showed the development of shoe making from the hand-sewed shoe to the present time, and included a description of a factory provided with all the modern improvements for health, comfort and safety of the employees and equipped with the latest type of shoe machinery.

Machine-shop Session

At the machine-shop session on the afternoon of Thursday, three papers were presented on the subject of grinding. They were: "The Field for Grinding," by C. H. Norton; "Precision Grinding," by W. A. Viall, and "Modern Grinding Methods," by B. M. W. Hanson. These papers are of such interest and importance that they will be printed, slightly condensed, in the American Machinist. For that reason an extended notice will not be given here.

Mr. Norton's paper made an earnest plea for coöperation between users and builders of grinding machinery, and for a scientific investigation of grinding by

engineers, in order to lay a firmer foundation for one of the most important and valuable of machine-shop processes. This plea was prefaced by the statement, "It is doubtful if many engineers have a clear conception of the field for metal grinding." In closing, Mr. Norton paid a tribute to three pioneers in the development of the art of grinding and building grinding machinery. The men thus appreciatively mentioned were: J. R. Brown, J. Morton Poole and Ambrose Webster.

A most valuable section of Mr. Viall's paper was a table giving the grinding limits for cylindrical pieces as adopted by his firm, the Brown & Sharpe Manufacturing Company. Mr. Viall said that he presented this table with a certain amount of hesitation, fearing that it would be accepted as a final word from his firm in regard to their practice and the practice that they recommended to others. However, he did not wish it taken in such a sense, but rather wished to have it used as suggestive and indicative of good practice, thereby forming a starting point from which others can develop standards and requirements particularly adapted to their own work.

Mr. Hanson's paper was largely devoted to surface grinding, using a cupped wheel.

All three papers showed numerous examples of ground work, giving the material of which the piece was made, the limits to which it was ground, and the time for individual operation, or the number of pieces produced per hour.

The discussion was animated and was participated in by several members. We will not attempt in this brief report to mention all who took part, but merely bring out some of the more important points.

A. L. DeLeeuw took issue with all literature that has been published on the subject of grinding, stating that it was far less valuable, fundamental and complete in its field, than that relating to many other standard machine-shop processes and machines. He deplored the absence of exact data in regard to the various elements that enter into successful grinding, and, referring to the papers presented, stated that they gave information in regard to results obtained, but did not give information from which these results could be analyzed, step by step. He also said that great care should be taken in selecting work for the miller or the surface grinder, with particular reference to the peculiar field and capabilities of each machine.

In partial reply Henry Hess questioned if there were any printed matter regarding the lathe, the planer, or the milling machine that was as fundamental in character as the information which Mr. DeLeeuw had just asked for in connection with the grinder. Referring to this same point in his closing, Mr. Norton renewed his plea for coöperation between user and builder of grinding machinery, asked that the users of grinding machinery visit the makers thereof in their own shops in order to see what is being done and how it is done, and stated that the hardest man to do business with is the "man from Missouri," who occupies a cynical questioning attitute and is unwilling to drop that mood long enough to make an intelligent study of the problem.

Henry N. Leland spoke with feeling and appreciation of the work of Joseph R. Brown, with whom he was associated at the time the universal grinder was developed, and said that the automobile of today would be an impossibility, were it not for the grinding process and modern grinding machines.

Gas Power Section

The annual meeting of the gas power section took place on Thursday afternoon and after the chairman's address it was announced that Robert H. Burnell had been elected chairman for the coming year. With him an executive committee composed of Messrs. Davidson, Dreyfus and Stillman was elected.

The first paper read was entitled "First Large Gas-engine Installation in an American Steel Works," by E. P. Coleman, of Buffalo, N. Y. This plant consists of 16 blowing-engine units of 2000 horsepower each and 8 electric generating units of 1000 horsepower each, combined with a plant for cleaning the blast furnace gas at the Lackawanna Steel Company. As Mr. Coleman had died but a few days before the meeting the paper was presented by E. E. Kiger, who was one of the several assistants of Mr. Coleman in this work.

Messrs. Connelly, Morgan, Delling, Eulling, Baker and the secretary of the meeting, took part in the discussion. A record of one engine that had run for 75 days without a stop was given. In another case the wear on the cylinder was shown to be 0.035 inch in five years. The cast-iron cylinders should be free from phosphorus and sulphur and allowed to cool slowly in the mold, then if the operating gas had a low dust content, there is no reason why the gas engine should not run successfully and with little wear. Several emphasized the necessity of clean gas and it was shown that 9/10 of the engine troubles and wear at this plant were caused from dust in the air that settled on the engine and naturally got into the working parts.

Mr. Morgan, of the Cambria Steel Company, expressed the opinion that the blast-furnace gas engine plant was not an economical proposition where coal could be obtained at $1 per ton as at the majority of steel works. The only exceptions he gave of steel works where the coal cost more than this were in Colorado, South Chicago and Bethlehem. He claimed that the fixed charges for operating the gas engine plant were greater than the difference in cost of fuel. He also thought that the turbo-blower manufactured by the General Electric Company was much better than the blast-furnace gas blowing engine as it occupied little space, was much simpler in construction and consequently the repairs would be fewer and the upkeep very inexpensive. He thought the cost of operating the blast-furnace gas engine plant would be from 2½ to 4 times as much as that of operating turbo-blowers.

The second and last paper read was "Notes on a Heavy-duty Gas Producer," by M. Latta, Milwaukee, Wis. In this he described the various styles of gas producers that had been made and showed the different methods of stirring the fire and getting rid of the ash. Very little discussion was given on this paper as it was largely descriptive of the different methods.

Conclusion

Thursday afternoon was concluded by an at home by Mr. and Mrs. Westinghouse, at the Hotel St. Regis, which was largely attended and universally regarded as a most enjoyable function.

The evening of Thursday was devoted to a lecture by Dr. Georg Kerschensteiner, superintendent of schools, Munich, Bavaria, on German Continuation Schools. The lecture was essentially the same as the one given at the Boston convention of the National Society for the Promotion of Industrial Education which was referred to in the report of that convention. The auditorium was well filled by the audience which listened to the lecture with close attention and showed its approval by unusually warm applause at its conclusion. A few words of well merited approval were spoken by Doctor Brashear, who also moved a vote of thanks for the lecture, which was passed by a rising vote.

Friday was devoted to a series of excursions to places of interest. The bunching of the excursions in a single day was an innovation. Among others there were excursions to New York Public Library, Pond Machine Tool Company, Robins Dry Dock, Nelson Goodyear, Inc., New York Telephone Exchange and Brooklyn Navy Yard.

Coincident with the launching of the 882-foot "Olympic," which may be here next season, comes the announcement of the approval of plans for a new 1000-foot Cunarder, to be propelled by 90,000 horsepower, and expected to be in service within two or three years.

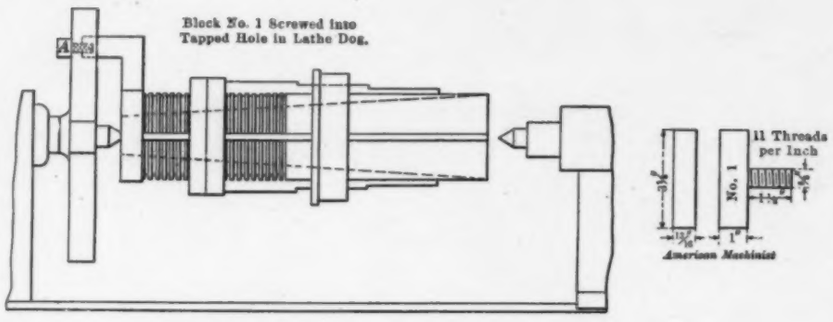
It is not often that a mechanical product is of such a character as to appeal to the theater goer. An exception to this is the vaudeville act of Prof. W. H. Van Dorn who uses Thermit as an attraction in welding two iron or steel bars in view of the audience.

Scheme for Holding Rod Brass Expanding Mandrel

By Chas. Markel*

The accompany line cut shows a very neat and inexpensive scheme to hold our rod-brass expanding mandrel on the centers of the lathe while changing the bushings on the mandrel, this lifting the heavy mandrel in and out of the lathe.

The driving dog is solid to the mandrel and the end of the dog that enters the lathe spider slot is tapped out 5/8 inch, 11 threads, to receive the tee-bolt *A*. This is simply turned one-half turn into the dog to lock the mandrel to the spider. Then the tailstock center can be removed, as shown, and the mandrel stays on the live center while changing bushings.



Method of Holding Mandrel on Lathe Centers

That idea was suggested by Herbert Jones, a machinist, and is a great labor saver on any heavy mandrel.

*Shop foreman, C. & N. W. Ry., Clinton, Iowa.

Increasing Shop Capacities

Metal Working

News items for the sales department—where more equipment will be needed. Authentic news is solicited for this department, not rumors or gossip—facts.

NEW ENGLAND

The foundry of L. G. McNight & Son, Gardner, Mass., was damaged by fire.

The Providence (R. I.) Machine Company is moving its plant to Whitinsville, Mass.

Kittsinger & Co., Sag Harbor, Me., are said to be considering the removal of their clock works.

Fire did $5000 damage at the plant of the Cameron Machine Company, 35 Hartford street, Boston, Mass.

The United Shoe Machinery Company, Beverly, Mass., intends to build several additions, including a new drop-forge plant.

A new building is being erected for the Meriden (Conn.) Fire Arms Company to be used as a machine shop for the toolmakers.

The Bristol Company, Waterbury, Conn., manufacturing pyrometers, gages, etc., has completed the erection of a three-story addition.

The Siro Carbureter Company, of Springfield, Conn., is said to be looking for a site for a plant for the manufacture of carburetors invented by F. W. Sickles.

Contract has been awarded for the erection of a $30,000 addition to the plant of the Hersey Manufacturing Company, Boston, Mass., manufacturing water meters.

Bevin Brothers Manufacturing Company, East Hampton, Conn., manufacturing bells, is erecting an addition to its iron foundry. Will build a buffing shop in the spring.

Agents of Platt Brothers, of Oldham, England, manufacturers of cotton-mill machinery, are said to be looking for a site in Fall River, Mass., on which to erect a branch plant.

The Charnack Manufacturing Company, Pawtucket, R. I., has incorporated with a capital of $50,000. Will manufacture machinery. Incorporators, Wm. H. Thornley, Chas. R. Heslam, Wm. H. Canfield.

The Sampo Manufacturing Company, Gardner, Mass., is being incorporated to manufacture an automatic pump patented by Mattl Louma, of Gardner. Capital, $100,000. K. A. Hannula, Waterford street, Gardner, will be president.

MIDDLE STATES

The Bucyrus (Ohio) Foundry and Machine Company will erect a plant.

The Rock Island (Ill.) Plow Company is completing additions to its plant.

The Kalamazoo (Mich.) Sheet Metal Works will build a new two-story factory.

The Hale Motor and Machine Company, Detroit, Mich., will erect a new factory.

The Crow Motor Car Company, Elkhart, Ind., will erect three new shop buildings.

The Ridgway Machine Company, Ridgway, Penn., will erect an addition to its foundry.

Deere & Co., of Moline, Ill., are completing two factory additions to their present plant.

The plant of the Ideal Stove and Range Company, Belleville, Ill., was destroyed by fire.

The Big Four Railroad has completed plans for additions to its shops at Bellefontaine, Ohio.

Philadelphia & Reading Railroad car shops, Schuylkill Haven, Penn., was burned. Loss, $25,000.

Rudolph Mueller will erect a garage and machine shop on Fourth street, near Cedar, Milwaukee, Wis.

The Cleveland (Ohio) Gas Meter Company has awarded contract for the erection of a new plant.

The Pennsylvania Railroad Company has announced that another steel-car plant will be built at Altoona, Penn.

Fire destroyed the plant of the Ideal Stove and Range Works, and the Roesch & Boul Plating Works, Belleville, Ill.

The Tri-City Railway Company will build new repair shops in Rock Island, Ill. J. G. Huntoon, Davenport, Iowa, manager.

The Crucible Steel Foundry Company will erect a new plant at Cleveland, Ohio, to replace that recently destroyed by fire.

The Cleveland (Ohio) Metal Stamping Company has commenced the erection of a new plant. New equipment will be needed.

The Crosby Company, Buffalo, N. Y., manufacturing sheet-metal work, is erecting an addition to its plant at Pratt and William streets.

The Croghan Foundry Company, Fremont, Ohio, has been incorporated by Arthur Hetrick, W. A. Baker, C. H. Voss, etc. Capital, $10,000.

The Ryder Brass Company, Bucyrus, Ohio, has been incorporated by B. H. Ryder, Arnold Ryder, E. A. S. Lenthold and others. Capital, $10,000.

The Universal Motor Company, of New Castle, Ind., is desirous of moving its plant to some other location, preferably in the New England section.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids January 10, for one engine lathe, as per Schedule No. 3171.

The West Pennsylvania Steel Company, Pittsburg, Penn., is to have a new plate mill erected; $200,000 is to be expended in this and other improvements.

The McKinley Locknut Company, Pittsburg, Penn., has been formed for the purpose of manufacturing a new locknut. L. S. Weaver, Pittsburg, is interested.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids December 27, for tool and cutter grinder, drill press as per Schedule 3153.

At Lima, Ohio, the announcement is made that the railroad shops of the Lake Erie & Western Railroad will be moved from Tipton, Ind., to that place early next year.

The Sanitary Machine Company, Chicago, Ill., has been incorporated to manufacture machinery. Capital, $50,000. Incorporators, H. G. MacLellan, R. E. J. Reardon, Joseph Marr.

At Coshocton, Ohio, ground has been broken for a large radiator plant to be erected by the Clow Company. The Clow Company has a large plant located in that city already.

M. & L. Machinery and Engineering Company, New York, has been incorporated with $50,000 capital, to manufacture machinery, etc., by P. Wohlstetter, S. A. Fuchs, A. Feiger.

The O'Neill Supply Company, New York, has been incorporated to manufacture metal articles. Capital, $10,000. Incorporators, Michael O'Neill, 462a Decatur street, Brooklyn, etc.

The Standard Separator Company, Schwaab building, Milwaukee, Wis., has purchased site in West Allis, on which a $100,000 factory for the manufacture of cream separators will be erected.

The Champion Ice Machine Company is being formed at Springfield, Ill., with $200,000 capital to manufacture an ice machine invented and patented by Thomas H. Dolan, of that place.

The Kessler Company, of Toledo, Ohio, manufacturers of electrical apparatus, is contemplating the erection of a factory on Howard street, near the Baltimore & Ohio railroad tracks.

The Motor Safety Crank Company, New York, has been incorporated to manufacture motors, engines and accessories. Capital, $50,000. Incorporators, M. G. Worth, F. A. Linn, G. Reef.

The Greenlie-Halliday Company, New York, has been incorporated to manufacture and deal in machinery, etc. Capital, $50,000. Incorporators, I. Lockwood, H. H. Remmers, J. C. Thomson.

The large factory building being erected by the Buckeye Stamping Company on South Parsons avenue, Columbus, Ohio, is nearing completion and will be ready for occupancy early in the year.

The Knaster Company, Jersey City, N. J., has been incorporated to manufacture cutlery and iron and steel ware. Capital, $10,000. Incorporators, Leon Knaster, Ferdinand Gouze, Emil Gouze.

The Automatic Spark Arrester Company, Buffalo, N. Y., has been incorporated to manufacture machinery, tools, etc. Capital, $50,000. Incorporators, E. Brombacher, R. J. Lehner, A. Winters.

The Batten-Dayton Motor Company, Chicago, Ill., has been incorporated with $125,000 capital to manufacture motors and accessories. Incorporators, W. O. Dayton, M. A. Dayton, E. S. Carr.

The Schultz Piston Ring Company, Schenectady, N. Y., has been incorporated to manufacture piston rings, etc. Capital, $25,000. Incorporators, S. S. Schultz, G. C. Mackerracher, C. L. Prince.

The Western Machine Company, Eau Claire, Wis., recently incorporated by P. J. Holm, has secured temporary quarters and will erect a plant in the spring for the manufacture of gas engines.

The Swanson Manufacturing Company, Marseilles, Ill., has been organized to manufacture implements and machinery. Capital, $250,000. Incorporators, H. S. Swanson, J. M. Johnson, G. O. Dietz.

The Mattoon Machine and Foundry Company, a recently organized concern, will erect a plant at Mattoon, Ill., for the manufacture of all kinds of castings. Machinery will be installed in the near future.

The Ginley Company, Akron, Ohio, has been incorporated to assemble and manufacture electrical apparatus. Capital, $25,000. Incorporators, U. Grant High, S. Elliott McAdoo, Robert P. Ginley, etc.

The Union Equipment Company, Camden, N. J., has been organized with $100,000 capital for the manufacture of wheels, car springs, car trucks, etc. Incorporators, V. A. Murray, J. R. Bradley, J. H. Kendig.

The Tire Chain Patents Company, Brooklyn, N. Y., has been incorporated to manufacture auto chains, accessories, etc. Capital, $25,000. Incorporators, F. Cormack, Port Ewen, E. E. Holmes A, W. Britton, New York.

The Perfecto Manufacturing Company, of Columbus, Ohio, was incorporated with a capital of $25,000 to manufacture all kinds of metal goods by M. J. Killets, C. H. Estey, H. T. Bailey, J. E. Killets and M. C. Welch.

The A. J. Clark Manufacturing Company, Youngstown, Ohio, has been incorporated to manufacture and sell acetylene-gas generators and similar apparatus. Incorporators, J. V. Price, A. W. Harthorne, A. J. Clark, etc. Capital, $50,000.

The Economy Metals Company, Newark, N. J., has been incorporated with $10,000 capital to manufacture flush valves, to do enameling and plating of metals, etc. Incorporators, Joseph W. Putnam, R. E. Fivey, Chas. W. Haberle.

The Imperial Motor Car Company, Cincinnati, Ohio, has been organized with $150,000 capital to operate garages and sales agencies for automobiles. Harry C. Straus, Frank H. Lamb, Jacob Straus, B. Chatten and Joseph G. Kinze, incorporators.

The Chelsea Aero Company, Incorporated, Oswego, N. Y., has been formed to manufacture aëroplanes, etc. Capital, $10,000. Incorporators, Chas. F. and Albert Flatchhart, 166 Eleventh avenue; Frederick Charaway, 225 Palisade avenue, New York.

A large addition is to be made to the old Brooks locomotive plant, at Dunkirk, N. Y., recently vacated by the boiler department, which was moved into the new boiler shop. The old boiler shop is to be refitted for use as a part of the machine department.

The Snow-Dole-Richards Company, New York, has been organized for the purpose of manufacturing and dealing in screw-machine products, tools, etc. Capital, $50,000. Incorporators, F. H. Richards, Hartford, Conn.; A. E. Snow, F. J. Dole, Brooklyn, N. Y.

Plans are being prepared by the engineering department of the Westinghouse Electric and Manufacturing Company for the construction of a new five-story building, which will be erected southeast of the printing plant at East Pittsburg. The report is that it will be used for the manufacture of automobile equipment.

James Quinlan and M. T. Handley, who were formerly identified with the Broaderick & Quinlan Manufacturing Company, manufacturers of boilers, at Muncie, Ind., have disposed of their holdings in that concern and have organized a new boiler works company, which will erect a large boiler plant at Indianapolis, Ind.

SOUTHERN STATES

C. C. Magann, Catlettsburg, Ky., will erect a two-story garage.

The Spalding Foundry Company, Atlanta, Ga., will rebuild burned plant.

Fire destroyed the foundry of the Casey-Hedges Company, Chattanooga, Tenn. Loss, $25,000.

The Hassell Iron Works Company, Colorado Springs, Colo., will erect a new foundry building.

The plant of the Pidgeon-Thomas Iron Company, Memphis, Tenn., was burned. Loss, $150,000.

The Chattanooga Southern Railroad will build shops at Alton Park, Tenn. C. H. Fisk, Chattanooga, chief engineer.

The Richmond (Va.) Iron Works Corporation is erecting a new building to be used for the manufacture of automobiles.

Improvements are to be made at the shops of the Gadsden (Ala.) Car Works, including an additional car-repair shop, etc.

The Georgia School of Technology, Atlanta, Ga., is to erect a foundry, blacksmith and administration building, at a cost of $50,000.

WEST OF THE MISSISSIPPI

The Spaulding Foundry Company, Atlanta, Ga., was burned. Loss, $50,000.

The St. Louis & San Francisco Railroad will construct a roundhouse at Lawton, Okla.

The Barr Brothers-Rogers Cutlery Company, of Eugene, Ore., will locate in Palo Alto, Cal.

The Salt Lake Railroad Company is making additions to its machinery equipment at the Los Angeles, Cal., shops.

The Bayer Steam Soot Blower Company, St. Louis, Mo., will erect a factory on Ewing avenue, near La Salle street.

The Eccles & Smith Company, San Francisco, Cal., would like catalogs of general machine-shop tools and supplies.

A modern commercial garage will be erected at Long Beach, Cal., by C. D. Hendrikson. Repair equipment will be installed.

The Santa Fe Railroad will increase the capacity of its shops at San Bernardino, Cal. Locomotive-repair equipment will be installed.

W. T. Harington, Los Angeles, Cal., will erect a commercial garage and repair shop on Green street. Modern repair equipment will be installed.

Equipment will be required in the new building addition being made at Orange, Cal., by C. W. Hollister. It will be used as a carriage-repair shop.

The Duplex Adding Machine Company has leased a building at 1900-02 Morgan street, St. Louis, Mo., and will manufacture a simplified adding machine.

The manual-training department of the South Pasadena, Cal., high school, is installing new machinery equipment—lathes, grinder, planer and additional apparatus.

The Western Wire Mattress Company, San Francisco, Cal., has leased a large building for the manufacture of its product. Extensive improvements are planned.

W. T. Garratt & Co., San Francisco, operating a brass foundry, have leased property and will erect a new building. Extensive improvements in equipment will be made.

J. S. King and associates, Des Moines, Iowa, are interested in a new plant for the manufacture of steel and copper cables to be erected on site still to be secured.

The J. D. Barnes Company, allied with the United Engineering Company, San Francisco, Cal., will build a large shipbuilding plant at San Pedro harbor (Los Angeles), Cal.

The Pioneer Commercial Auto Company, Los Angeles, Cal., is contemplating the establishment of a second garage and repair station. Repair equipment will be required.

The Brammer Manufacturing Company, Davenport, Iowa, is erecting a new plant to replace the one burned. The concern manufactures washing machines, woodenware, etc.

The Kibby-Workinger Foundry Company, Elkhart, Ind., has been organized with $25,000 capital to do a foundry and machine business.

Incorporators, O. E. Kibbe, Z. G. Kibbe, E. M. Workinger.

The Los Angeles Railway Company, Los Angeles, Cal., has formed another corporation for $5,000,000, fully paid, for construction and improvement work. Extensive operations are planned.

The Southern Pacific Railroad will expend $200,000 on new shops to be erected either at Benson or Bowie, Ariz., to replace those recently burned at Tucson, Ariz. Plans are being made at San Francisco, Cal.

CANADA

Connell Brothers' foundry, at Woodstock, N. B., was damaged by fire to the extent of $25,000.

Wedin Brothers' machine shops, at Midale, Sask., destroyed by fire, will be re-equipped Loss, $30,000.

E. W. McLean, of Vancouver, is president of the Canadian Electric Manufacturing Company, which will build a large factory at Vancouver to manufacture electric water heaters.

The Murray Brass Manufacturing Company, Windsor, Ont., has taken out incorporation papers. Will do a business of brass, copper and sheet-metal manufacturing. Capital, $40,000. Incorporators, Wm. D. Murray, John Lewis Schneider, of Detroit, Mich.; Wm. C. Kennedy, of Windsor.

General Manufacturing

NEW ENGLAND

The Locustville Mill, at Hope Valley, R. I., was destroyed by fire.

The Niantic Dyeing Company, Niantic, R. I., will erect a new bleachery.

H. G. Hills, East Hampton, Conn., is erecting a factory for the manufacture of toys.

The Massachusetts Lime Brick Company is to locate a large factory at Oxford, Mass.

The Robert D. Mason Company, Pawtucket, R. I., will build an addition to its bleachery.

The Rathbun Knitting Company, Woonsocket, R. I., will build a two-story addition.

The Penobscot Realty Company has commenced work on a power plant at Orono, Me.

The B. F. Smith Company, contractors, Providence, R. I., will erect a carpenter shop.

The Sunset Packing Company, East Pembroke, Me., is looking for a site for a new plant.

The H. A. Wilbur Ice Company, Leicester, Mass., is to erect a 10,000-ton ice-house addition.

The Hampton Company, Easthampton, Mass., will erect a two-story addition to its yarn mill.

The Estabrooks Company is to open a branch of the Oxford Linen Mills, at Brookfield, Mass.

The plant of the Carlisle-Ayer Window Sash Company, at Boston, Mass., was badly damaged by fire.

The N. E. Whip Company, Westfield, Mass., has leased a building to be used in connection with its plant.

The Summit Thread Company, East Hampton, Conn., is to install individual motor drive in its plant.

The Geo. H. Gilbert Manufacturing Company, Gilbertville, Mass., is building an addition to its woolen mill.

The plant of the Farr Alpaca Company, Holyoke, Mass., is nearing completion. New machinery will be installed.

The Royal Linen Mills Company intends to further increase the capacity of its new plant, opened at Mystic, Conn.

A mill and dry house will be built for the Palmer & Parker Company, in the rear of 83-103 Medford street, Charlestown, Mass.

The Bay View Bottling Company is erecting a three-story addition at East Eighth and Hamilton streets, South Boston, Mass.

The Hallett-Davis Piano Company, of Boston, Mass., is erecting a new plant at Neponset, Mass., which will cost about $600,000.

The South Boston Electric Light and Power Company, Boston, Mass., is to erect a dam and power house to furnish 14,000 horsepower.

The Morrison Woolen Company, Dover, Me., has been incorporated with $40,000. The officers are N. M. Morrison, president; John L. Morrison, secretary.

The National Seat and Novelty Company, of New York, will erect a plant in Hop River, Conn. The company manufactures chair seats, suit cases, etc., from leather and paper pulp.

The Charnack Manufacturing Company, Pawtucket, R. I., has been incorporated with $50,000 to manufacture machinery. Incorporators, W. H. Thornley, C. R. Heslam and W. H. Canfield.

The Anawan Mills Company, Fall River, Mass., has leased a plant and will manufacture textile fabrics, was recently incorporated with $50,000.

MIDDLE STATES

A. Hollander & Co., Newark, N. J., will build a new power plant.

The Detroit Edison Company, Detroit, Mich., will erect an addition.

Ballston Spa, N. Y., is considering the acquisition of a village gas plant.

The city of Lima, Ohio, is considering the construction of a filtering plant.

The Defiance Paper Company, Niagara Falls, N. Y., will erect a new plant.

The Philadelphia (Penn.) Rubber Company will erect an addition to its plant.

Masontown, Penn., will erect a municipal pumping plant, water and sewage system.

The General Bakelite Company, Perth Amboy, N. J., will erect a $250,000 plant.

The Sterling Mills, Ilion, N. Y., is planning to build an addition to its woolen mill.

S. S. & T. B. Davis, Rock Island, Ill., have commenced the erection of a power plant on Rock river.

The Lincoln Ice Company, Chicago, Ill., will erect an ice plant at Carroll avenue and Elizabeth street.

Rosenberg & Katz, Mount Vernon, N. Y., are building an $8500 factory to manufacture rubber raincoats.

The Duplex Power Company, Charlotte, Mich., is said to be contemplating the removal of its plant.

The Lowden Packing Company, Terre Haute, Ind., is looking for a suitable location for a branch plant.

The table factory of C. H. Heckeroth, 1432 West Randolph street, Philadelphia, Penn., was destroyed by fire.

The plant of the York Woodworking Company, at West York, Penn., was destroyed by fire. Loss, $40,000.

The Charlotte (Mich.) Manufacturing Company, making library tables, is considering tthe removal of its plant.

A five-story addition will be erected at the plant of Steinman & Meyer, furniture manufacturers, Cincinnati, Ohio.

Alexander Brothers, Philadelphia, Penn., manufacturers of leather belting, will erect a six-story factory building.

The Home Telephone Company, Peru, Ind., is preparing to ask for bids for the construction of an exchange building on Broadway.

The British-American Company, of Cincinnati, Ohio, manufacturing rosin, is to erect a new plant on Spring Grove avenue.

The Sterling-Moline Traction Company, headquarters, Sterling, Ill., will commence the construction of a 110-mile interurban line.

The plant of the Layton Park Woodwork Company, 1095 Twenty-sixth avenue, Milwaukee, Wis., was destroyed by fire. Loss, $20,000.

The Huebner-Toledo Breweries Company, of Toledo, Ohio, will erect three new buildings to consist of brew house, bottling plant and refrigerator house.

Wm. B. Kirk has had plans prepared for an additional three stories to the Kirk block, Syracuse, N. Y., which cal for the installation of more elevators.

The Cowie Window Company, of Danville, Ind., has been reorganized and arrangements are being made for the erection of buildings and installation of machinery.

The American Railroad Tie Company is being organized by John C. Rogers, of the Provident Bank building, Cincinnati, Ohio. Site has been selected in Norwood.

James A. Shufelt is to have a mill building and boiler house erected at Albany, N. Y., to be used in the manufacture of knit goods. A $40,000 company is to be formed.

The Toledo & Indiana Railroad Company has been incorporated at Toledo, Ohio, to construct an electric railway. Incorporators, Geo. D. Wellis, Henry Isenberg, Frank Miller.

The Franklin Woodenware Company, of Columbus, Ohio, will soon install machinery in its factory on East Chestnut street, where a full line of wooden articles will be manufactured.

The Home Laundry Company, Cleveland, Ohio, has been formed with $60,000 to operate a laundry by J. E. Mentzer, Thomas Miller, Andrew Black, Asa L. Knight and C. E. Beckwith.

The H. H. Gray's Son Company, Syracuse, N. Y., manufacturer of fine shoes, has completed its new five-story factory and expects to commence immediately the installation of the machinery.

The Mooresville (Ind.) Water, Light and Heat Company, recently incorporated, will build a combined water, light and heat plant. E. L. Denpree, Clarence Denpree, E. H. Emerick, are directors.

The Anderson Carriage Company has just completed, at Detroit, Mich., a new three-story building, 314x82 feet, which is to be occupied by the Elwell-Parker Electric Company, of Cleveland, Ohio.

The Syracuse (N. Y.) Arena Company has let the contract for the building of an assembly and amusement hall, casting $100,000, requiring heat, light and refrigerating machinery, the latter for a summer ice tank.

Plans are being drawn to double the capacity of the Mentor (Ohio) Knittng Mills Company and large additions and new machinery will be provided. The capital of the company was recently increased to $1,000,000.

Collier Co-Operative Wheel Company, Cleveland, Ohio, has been incorporated to manufacture and sell wheels for all kinds of vehicles. Incorporators, Charles Collier, Edwin A. Collier and C. Cole. Capital, $50,000.

Crouse-Hinds Company, Syracuse, N. Y., manufacturer of switchboards, street-car headlights, conduiets, etc., has completed the plans and intend to let the contracts by the first of the year for the erection of a $200,000 plant on its Wolf street property.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will receive bids December 27, for one 15-ton traveling crane (schedule 3151), one railroad scale (schedule 3152), and on January 10, for one electric traveling crane (schedule 3170).

The Wabash Refining Company, of Columbus, Ohio, has been incorporated with an authorized capital of $400,000 to do a refining business in oils and deal in petroleum, etc., by Calvin G. Selby, Frank E. Ruth, R. A. Fouts, F. C. Camnitz and M. H. Recob.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids December 20, for steel bolts and nuts (schedule 3164), machinists sets (schedule 3160), 7700 pounds naval rolled brass, 5100 pounds sheet brass, 30,000 pounds manganese bronze (schedule 3166), 27,000 pounds sheet brass, nickel steel forgings (schedule 3155), 6050 pounds solder, 5000 pounds medium steel angles, bar steel, 82,000 medium plate steel (schedule 3159), steel tubing (schedule 3162), brass pipe fittings, brass valves (schedule 3164).

SOUTHERN STATES

Knabe Brothers, Baltimore, Md., propose the erection of a large new plant.

The River Falls (N. C.) Cotton Mills Company will probably soon order the erection of a plant.

Henry Leiman will establish a box factory at Key West, Fla. Mr. Leiman operate a box factory at Tampa, Fla.

W. A. Burkhart, of the Vine Grove (Ky.) Milling Company is considering the installation of an electric-lighting plant.

The Mastic Wall Board and Roofing Manufacturing Company, of New Orleans, La., will erect a plant in Ivorydale, Cincinnati, Ohio.

WEST OF THE MISSISSIPPI

The city of Stilwell, Okla., voted $40,000 bonds for waterworks.

The city of Ellensburg, Wash., will install a municipal water system.

A. J. Lyon & Co., Meridian, Miss., will erect a cold-storage plant.

The Buell Planing Mill, East Dallas, Tex., was partly destroyed by fire.

The city of Braymer, Mo., is considering the construction of waterworks.

The Northern California Power Company will erect a gas plant at Willows, Cal.

The Globe Milling Company, San Diego, Cal., is building an addition to its plant.

The plant of the Dallas (Tex.) Ice and Fuel Company was badly damaged by fire.

W. T. Wheatley, Wilmington, Cal., will establish a large lumber plant in this vicinity.

The city of Lordsburg, Cal., contemplate the installation of a municipal water system.

The Hercules Buggy Works, Evansville, Ind., has taken out a permit for a $15,000 addition.

The city of Santa Cruz, Cal., will install a municipal incinerating plant. Bids will soon be asked.

The city of Kiowa, Okla., has voted $18,000 for extension of waterworks and electric-light plant.

The Fontana Water Company, Rialto, Cal., is building a factory for the manufacture of cement pipe.

J. B. West, Lewiston, Idaho, contemplates the erection of a power plant for railway and lighting work.

The city of Anaheim, Cal., will install a sewer system to cost $90,000; bonds will be voted for this sum.

Fire destroyed the plant of the National Lumber Box and Package Company, Omaha, Neb. Loss, $25,000.

A new engine and generator will be added to the plant of the Sikeston (Mo.) Ice, Light and Power Company.

The Crescent Creamery Company, Los Angeles, Cal., will erect a large cold-storage plant at Artesia, Cal.

The Long Beach Water Company, Long Beach, Cal., contemplates extensive improvements in its water system.

Joseph Hitz, of Madison, Ind., and associates, will erect a large vegetable canning factory at San Benito, Tex.

The Great Western Power Company, San Francisco, Cal., will extend its system to Albany, Cal. (north of Berkeley).

The Tacoma Gas Company, Tacoma, Wash., will build a large modern gas plant early in 1911. About $300,000 will be expended.

The Southern California Edison Company, Los Angeles, Cal., contemplates the erection of a power plant in the Santa Ana cañon.

Sanichas Brothers, Phœnix, Ariz., will erect a factory building at Third and Madison streets. The company manufacture candy.

The Dexter (Mo.) Electric Light and Power plant is in the market for a 75- or 100-horsepower Corliss engine. M. B. Eicholtz, proprietor.

The McHenry-Millhouse Manufacturing Company, South Bend, Ind., manufacturing roofing materials, is erecting an addition to its plant.

Pumping equipment and irrigation apparatus will be required for improvements contemplated at Red Bluff, Cal., by Mrs. Lewis Thompson.

The South Eastern Missouri Ice, Light and Power Company, Charleston, Mo., will add one engine and two boilers to its present equipment.

The Great Western Power Company, San Francisco, Cal., will enlarge its Island Bar power house. The capacity will be increased one-fourth.

The city of Ashland, Ore., will make improvements in its municipal water system. One hundred and sixty thousand dollars will be expended.

The National Powder Company, Spokane, Wash., will make extensive alterations and additions to its large factory at Bishman (near Spokane).

I. O. Wilson, Santa Ana, Cal., has organized a company for the manufacture of a patent automobile tire. A plant is contemplated in this vicinity.

The Rincon Warehouse Company, San Francisco, Cal., is erecting a modern warehouse to cost $200,000. Modern equipment will be installed.

Heating equipment and apparatus will be required by Vlasnick & Son, Bakersfield, Cal., in rebuilding its Crystal bath house, recently destroyed by fire.

The city of Fort Smith, Ark., will purchase waterworks system and will spend about $100,000 for improvements. M. H. Reed, city engineer.

Heating and ventilating equipment will be installed in the new Kern county, Cal., high school. R. L. Stockton, Bakersfield, Cal., secretary board of education.

Steam heating, vacuum cleaning and air-drying equipment will be required in the new apartment house to be erected in San Francisco, Cal., by Reuben Cohen.

The Pacific Gas and Electric Company, San Francisco, Cal., will soon commence work on a new substation at Colusa, Cal. New power-line extensions will also be made.

The South Bend (Ind.) Mill and Timber Company has been incorporated for $10,000 to erect a new planing mill. Jacob E. Kuntz, Samuel W. Cordray, etc., are incorporators.

Latest factory appliances will be required in the new factory of the Stockwell-Haley Company, manufacturing mattresses and household equipment, to be erected at Los Angeles, Cal.

The buildings of the Stockton Mineral Baths, Stockton, Cal., were destroyed by fire November 27. They will be immediately rebuilt. Pumping equipment and apparatus will be required.

W. J. Hole, Los Angeles, Cal., is at the head of an enterprise to improve property in the Mohave Valley, Cal. A complete irrigation system will be installed and equipment will be required.

The W. C. Hendrie Rubber Company, 1236-1240 Broadway, Denver, Colo., is arranging for the establishment of a plant for the manufacture of rubber-pump valves and molded rubber goods.

The Delta Ice and Cold Storage Company, Vicksburg, Miss., has been incorporated with $100,000 capital by Chas. H. Zilker, of New Orleans; W. W. Johnson, of Memphis, Tenn., etc. Will erect a $75,000 plant.

Officers of the Pacific Light and Power Company, Los Angeles, Cal., have incorporated their subsidiary company the Domestic Gas Company into the Southern California Gas Company, for $10,000,000. Extensive improvements and new construction work is contemplated.

CANADA

Smith Falls, Ont., will greatly extend its waterworks plant.

Rouleau, Sask., will install a complete new electric-lighting plant.

T. Pickering will locate a large canning factory at Blenheim, Ont.

Pembroke, Ont., will spend $65,000 for new waterworks machinery.

Stratford, Ont., will spend $50,000 improving its electric-lighting plant.

The Atlantic Sugar Company will build a very large refinery at St. John, N. B.

Fort William, Ont., will spend $25,000 for new electric-lighting machinery.

The Alabastine Plaster Company is building a large factory at Caledonia, Ont.

The Fallbrooke Roller Mills, of Perth, Ont., were destroyed by fire. Loss, $90,000.

Regina, Sask., will install a complete new electric power plant costing $135,000.

Souris, Man., will buy a large quantity of new hydrants, gate valves and valve boxes.

The city of Kingston, Ont., will spend $15,000 for new electric-lighting machinery.

The Dominion Sewer Pipe Company is building a new factory at Waterdown, Ont.

E. W. Hanna, of Winnipeg, is president of the Canadian Carbon Company, which is building a new factory at Winnipeg.

The manager of the American Linseed Oil Company, of Chicago, is interested in a very large linseed mill to be located at Regina, Sask.

MINING

The Fairview Mining camp, at Fairview, Nev., will install a 100-ton mill.

The Goldfield Daisy Mining Company, Goldfield, Nev., contemplates extensive development work.

The United Verde Copper Company, Jerome, Ariz., is installing new equipment at its plant.

The Bisbee-Sonora mine, near Paradise, Ariz., will make extensive improvements in its equipment.

The Cananea Consolidated Mining Company, Cananea, Mexico, is installing new equipment at its plant.

The Mountain Copper Company, operating in the Balaklala district, Cal., contemplates the erection of a new smelter.

W. C. Marshall, manager of the Twin Peaks Mining Company, Duncan, Ariz., is installing new hoisting equipment.

The Creston de Cobre mine, near Hermosillo, Sonora, Mexico, will soon be in the market for concentrating equipment.

The Ameca River Gold Mining and Milling Company, Tetitlan, Jalisco, Mexico, is making improvements in its equipment.

The Big Four Mining Company, operating in the Hoag district, Cal., will soon commence the erection of a cyanide plant.

The Malpai Mining Company, in the Kirkland Valley section, Ariz., is making extensive improvements in buildings and machinery.

The Mabel Copper Company, operating in the Dragoon mountains, near Benson, Ariz., contemplate heavy development in this district.

The Hercules Mining Company, operating near Kingman, Ariz., is installing new machinery and electrifying its present equipment.

The Arizona-Nevada Copper Company, operating in the Eureka section, near Prescott, Ariz., is making improvements in its equipment.

The Manhattan Milling and Leasing Company, operating the Canyon mill, Manhattan, Nev., is making extensive improvements to its plant and installing new equipment.

The Combination Fraction Company, operating near Goldfield, has completed improvements on its 20-stamp mill. The company contemplates extensive additions to its plant in the future.

Business Items

The American Emery Wheel Works, Providence, R. I., was awarded a gold medal at the Brussels Exposition for its exhibit of grinding wheels and abrasive products.

Controlling interest in the Davis Expansion Boring Tool Company has been bought by W. N. and Claude L. Matthews, of St. Louis, and the name of the concern has been changed to the Matthews-Davis Tool Company, the officers being as follows: W. N. Matthews, president and treasurer; E. E. Davis, vice-president; Claude L. Matthews, secretary.

Trade Catalogs

The Franklin Portable Crane and Hoist Company, Franklin, Penn. Catalog. Franklin portable crane and hoist. Illustrated, 30 pages, 4x7 inches, paper.

Smooth-On Manufacturing Company, 572 Communipaw avenue, Jersey City, N. J. Booklet. Smooth-On paint for iron and steel. Illustrated, 12 pages, 3x6 inches.

The Cleveland Twist Drill Company, Cleveland, Ohio. Catalog No. 37. Drills, reamers, sockets, counterbores, mills, mandrels, etc. Illustrated, 214 pages, 6x9 inches, paper.

Garvin Machine Company, Spring and Varick streets, New York. Circular No. 135. No. 2-A universal milling machine. Illustrated. Circular No. 152. No. 2 two-hole grinding machine. Illustrated.

The C. F. Pease Company, 167 Adams street, Chicago, Ill. Catalog. Blueprint machinery, direct whiteprint machinery, drafting-room supplies. Illustrated, 6x9 inches, 94 pages, paper.

Simplex Tool and Supply Company, Boston, Mass. Catalog. Gas-blast furnaces, oil hardening furnaces, forges, pressure blowers. Illustrated, 32 pages, 7x9 inches, paper. Pamphlet. "How to Harden Tool Steel," by H. B. Eaton.

General Electric Company, Schenectady, N. Y. Bulletin No. 4786. Signals, auxiliary apparatus and materials. Illustrated, 90 pages, 8x10½ inches. Bulletin No. 4602B. Automatic voltage regulators for direct-current generators. Illustrated Bulletin No. 4872. Direct-current exciter panels. Illustrated.

Forthcoming Meetings

Society of Automobile Engineers, annual meeting, January 11 and 12, New York City; C. F. Clarkson, secretary, 1451 Broadway, New York City.

The National Civic Federation, eleventh annual meeting. January 12-14, New York City; D. L. Cease, secretary, 1 Madison avenue, New York City.

National Metal Trades Association, annual meeting, April 14, 1911, New York City, Hotel Astor. Robert Wust, commissioner, New England building, Cleveland, Ohio.

American Foundrymen's Association, annual convention, Pittsburg, Penn., May 23 to 26, 1911. Richard Moldenke, secretary, Watchung, N. J.

American Society of Mechanical Engineers; monthly meeting second Tuesday. Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York City.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month, Young's hotel. D. F. S. Clark, secretary, 141 Milk street, Boston, Mass.

Providence Association of Mechanical Engineers. Monthly meeting fourth Tuesday each month. E. C. Bliss, president, 91 Sabine street, Providence, R. I.

New England Foundrymen's Association; regular meeting second Wednesday of each month, Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Engineers' Society of Western Pennsylvania; monthly meeting third Tuesday. Elmer K. Hiles, secretary, Fulton building, Pittsburg, Penn.

Superintendents' and Foremen's Club of Cleveland; monthly meeting third Saturday. Philip Frankel, secretary, 310 New England building, Cleveland, O.

Western Society of Engineers, Chicago, Ill. Regular meeting first Wednesday evening of each month, excepting July and August. Secretary, J. H. Warder, 1735 Monadnock block, Chicago, Ill.

Philadelphia Foundrymen's Association; meetings first Wednesday of each month, Manufacturers Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45 North, Philadelphia, Penn.

WANTS

Rate 25 cents per line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday for ensuing week's issue. Answers addressed to our care, 505 Pearl street, New York, will be forwarded. Applicants may specify names to which their replies are not to be forwarded, but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendations or other papers of value should not be inclosed to unknown correspondents. Only bona-fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.

Miscellaneous Wants

Caliper catalog free. E.G.Smith, Columbia, Pa.

We buy or pay royalty for good patented machine or tool. Box 282, AMER. MACHINIST.

Wanted—Work for screw machines and gear cutter. Box 775, AMERICAN MACHINIST.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Special machinery designed; drafting, tests, reports. Reliance Eng. Co., 113 Beekman street, New York City.

Light and medium weight machinery and duplicate parts built to order; tools, jigs, etc. MacCordy Mfg. Co., Amsterdam, N. Y.

Patents. C. L. Parker, Patent Attorney, ex-examiner Patent Office, 900 G St., Washington, D. C. Write for Inventor's Handbook.

Wanted—Spur gear cutter to take 8-foot gears; state condition fully and where can be seen. Dillon-Box Iron Works Co., Denver, Colo.

Wanted—Machine shop to manufacture and market new labor saving machine without any competition; royalty or cash. Box 258, AMERICAN MACHINIST.

We want to get in touch with a reliable large factory that can turn out high class slot machine work of guaranteed character. Address "B," AMERICAN MACHINIST.

Wanted—Well equipped machine shop wants specialty or article of general manufacture to make and sell under royalty arrangement, or will buy outright. Box 219, AMER. MACH.

We have several thousand best quality red fiber disks 9/16 inch thick, 1 11/16 inches diameter, with half-inch hole; attractive price will be named you. Write to the Uncas Specialty Company, Norwich, Conn.

Large English firm of machine tool importers having showrooms and offices in Great Britain, France, Germany, Italy, India and Japan is wanting good agencies for machine tools of all kinds. Box 189, AMER. MACH.

Nutter & Barnes Company, Boston, Mass., have one of the best equipped machine shops and solicit lathe, planer, milling machine, turret lathe, drill, gas engine or automobile machine parts work, by day or contract.

Manufacturer Wanted—Inventor of pocket umbrella, size 12 inches long, 1¼ inches diameter when folded; would place invention on royalty; demand unlimited; manufacturers with large facilities only need reply. Box 50, Canton, Ohio.

Belgium—A leading firm for the construction of steam engines in Belgium, having first class machinery of the latest design and a perfect business organization is prepared to manufacture engineering specialties. Address Box 254, AMERICAN MACHINIST.

Partnership wanted by experienced steam and mechanical engineer in good equipped machine shop in or near Chicago; expert designer on marine, Corliss and high speed engines, turbine compressors, rotary pumps, condensers, hoisting engines, mining and general machinery; highest references. Box 253, AMERICAN MACHINIST.

Opportunity—A Mechanical engineer having had the designing of bi-product machines for a company which has sold over three thousand without any competition, is in a position to design similar machines, which sell for less with a greater profit and of better design; machines cost $80 to manufacture and sell for $250; can substantiate all of the aforesaid. "Opportunity," AM. MA.

Uptodate machine shop; owner partially disabled, now manufacturing a well known line of patented tools, sold to largest supply houses at home and abroad; will sell whole or in part, consolidate with manufacturer of a similar line, or join with active progressive party with equal capital. Inquiries strictly confidential, full details given and will be requested from interested parties. Box 269, AMERICAN MACHINIST.

Wanted to negotiate with owners of first class machine and foundry plants who will consider removal to a thriving town, the population of which has doubled in five years and is bound to become much larger in the near future; much outside capital is pouring into the vicinity, and there is an urgent demand for a complete plant and competent managers; local capital will take stock and assist in putting such a concern on its feet. Address Jesse Dimond & Co., Rockford, Ill.

HELP WANTED

Classification indicates present address of advertiser, nothing else.

MASSACHUSETTS

Machinist; experienced as toolmaker and foreman; state age, experience in full, references and pay required. Box 270, AM. MA.

Head draftsman and designer, experienced on rotary printing presses and folders. Box 132, AMERICAN MACHINIST.

A company, building high grade machine tools which they sell direct, require men who have the ability to make first class demonstrators; they must have mechanical ability, be diplomatic and persistent; the right men will be given a course of instruction in the shop, and a good position; unmarried men preferred; give full information as to experience, age, etc. Box 233, AMER. MACHINIST.

MICHIGAN

Wanted—Experienced assemblers and mounters for machine tool work; steady work and good wages to the right men; ideal shop conditions. Grant & Wood Mfg. Co., Chelsea, Mich.

MISSOURI

Superintendent for plant of 200 employees in a large western city; competent to design dies and devise methods for the production of metal parts of medium high class; to master the details of the other branches of the factory and to assume full control; we want a high grade man for a high grade position; no other will do; give full details in reply; strictly confidential. Box 263, AMERICAN MACHINIST.

NEW JERSEY

Wanted—First class printing press designers, draftsmen and detailers; good position for men of ability. Hall Printing Press Company, Dunellen, N. J.

Wanted—Planer hand, one that can handle all classes of small machinery; give full particulars as to last two places employed, wages expected, and age. Box 257, AMER. MACH.

Wanted—A first class printing press mechanic, to fill position of inspector and foreman of assembling floor; must be a trained mechanic with experience in determining accuracy at work, and its requirements in fitting and operation; a man of judgment who will assume responsibility. Hall Printing Press Company, Dunellen, N. J.

NEW YORK

Wanted—Young man for erector and demonstrator of high grade line of machine tools; splendid opportunity if competent. Box 249, AMERICAN MACHINIST.

Wanted—First class machine tool salesman, with practical experience preferred; must be alive and competent to produce results. Box 247, AMERICAN MACHINIST.

Wanted—Young, active sales manager to sell machine tools and special machinery; state age, experience, references and salary expected. Box 248, AMERICAN MACHINIST.

Wanted—Two first class horizontal boring mill hands; must be competent to produce rapidly, first class accurate work; good opportunity; permanent position if competent. Box 246, AMERICAN MACHINIST.

Wanted—Draftsman for special machinery; shop experience desirable; one familiar with sheet metal machinery preferred; state full particulars; good opening for right party. "X. Y.," AMERICAN MACHINIST.

Draftsman (mechanical) wanted to prepare line drawings for illustrations; must be neat, rapid tracer, letterer, also be able to interpret sketches, blueprints, etc. Apply by letter only, inclosing specimen of work. Box 218, AMERICAN MACHINIST.

German mechanical engineer wanted: to introduce American hydraulic apparatus in Germany; must possess technical education, some American experience and suitable references. Address by letter only, stating salary desired. T. L. Van Norden, 90 West St., New York City.

OHIO

Wanted—Boring bar and boring mill men at once; night shift; state age and experience. The Heisler Company, St. Marys, Ohio.

Wanted—Experienced crane erectors; steady employment; give reference, state experience and name wages desired. Box 244, AMERICAN MACHINIST.

Wanted—First class machinists, toolmakers, die sinkers, lathe, planer, drill press, screw machine, boring and milling machine operators, wood and metal patternmakers, brass polishers, buffers, finishers, millwrights, hammermen and blacksmiths, who wish to increase their opportunities, to register with the free Employment Department of the National Metal Trades Association, New England Building, Cleveland, Ohio.

PENNSYLVANIA

Agents sell the gem pocket rule holder in every shop; new invention; just out. New Invention Company, Box 1008, Wilmerding, Penn.

Wanted—First class foreman who can invest about $2500 in the business to take charge of shop running about thirty men and manufacturing machine tools. Box 268, AM. M.

Sales manager by a concern in eastern Pennsylvania, manufacturing ornamental and builders' iron work; must have executive ability with knowledge of estimating and costs; state age, qualifications and amount of salary expected. Box 271, AMER. MACHINIST.

Skilful toolmaker, between 22 and 30 years, will be given an opportunity to acquire part interest in a business in return for wholesouled work; no financial resources required. Address, with full history, statement of present and previous earnings and references, all to be considered as confidential and returned, Box 259, AMERICAN MACHINIST.

The Monotype School is maintained to train young men to meet the constant demand for operators of our type casting and composing machine; these operators do so well that we receive more applications for places than can be filled; these qualifications carry most weight: Common sense, automatic machinery experience, printing office experience, type foundry experience. Full particulars will be furnished to inquirers who furnish the same information about themselves, and mention this paper. Lanston Monotype Machine Co., Philadelphia.

WISCONSIN

Expert tool designer, having shop experience as well as technical training in pressed steel work to take charge of tool drafting room for large stamping plant in Milwaukee; unusual opportunity for an ambitious and capable man; state salary and past experience. Box 166, AMERICAN MACHINIST.

SITUATIONS WANTED

Classification indicates present address of advertiser, nothing else.

MASSACHUSETTS

First class diemaker wants position with manufacturing concern; can furnish best of references. Box 255, AMERICAN MACHINIST.

MICHIGAN

General storekeeper, thoroughly experienced, desires change; location immaterial. Box 264, AMERICAN MACHINIST.

Superintendent or foreman of drop forge department; fifteen years' experience and can give best of reference; will go anywhere, East or Middle West. Box 238, AM. MACH.

NEW JERSEY

Master mechanic wants position at $2000; age 37. Box 236, AMERICAN MACHINIST.

Master mechanic, age 36; small machinery, dies, tools, manufacturing; salary $2000. Address "Ingenuity," Box 265, AMER. MACH.

Situation Wanted—Machine shop foreman, thoroughly experienced in hydraulic machinery, engines and general work; uptodate in modern manufacturing methods; A-1 references. Box 267, AMERICAN MACHINIST.

Mechanical engineer, draftsman and machinist by trade, now engaged in important engineering work, executive ability, practical experience in uptodate manufacturing, sober and about forty years old, seeks position with growing manufacturing concern. Box 256, AMERICAN MACHINIST.

Mechanical engineer, American, 28 years of age, six years' practical experience in mechanical work and now holding a responsible position with large manufacturing company, is looking for an opening with growing manufacturing company where engineering and executive ability are required; good opening with opportunity for future more necessary than large salary to start. Box 262, AM. MA.

NEW YORK

Chief draftsman and general foreman, practical mechanic, now employed, would like a position in Greater New York. Box 237, AMERICAN MACHINIST.

Machine tool salesman covering Greater New York, at present employed, wishes to make a change; manufacturer preferred. Box 273, AMERICAN MACHINIST.

Foreman, 34, now engaged; medium or heavy work; thoroughly conversant with piece work and uptodate methods; electrical or general machinery; references from present employer. Box 266, AMER. MACHINIST.

Successful experience as executive, inventor, designer, systematizer and mechanic in manufacturing lines; maximum salary previously received $2600 per annum; willing to start at bottom. Box 260, AMERICAN MACHINIST.

In West, Middle or Southwest, position requiring a high grade man with brains, initiative, ability and experience; salary secondary consideration; engineering, mining or manufacturing. Box 226, AMERICAN MACHINIST.

Superintendent and master mechanic desires change; expert sheet metal lines; special knowledge black shapes, seamless or pieced enameling or galvanizing; executive and mechanical ability; uptodate tool and die designing. Box 242, AMERICAN MACHINIST.

Machinist, German master mechanic, A-1 references as to character and capabilities, experience in designing all kinds of tools, dies, jigs (small), and automatic machinery for interchangeable work, wants position as foreman. Box 280, AMER. MACH.

Superintendent by an energetic first class man; 17 years' experience; can produce highest grade of work at lowest cost; successful in organizing and handling help; expert on tools, fixtures, dies, special and automatic machinery; best of references. Box 279, AMERICAN MACHINIST.

Machinist, high-grade toolmaker, die maker, age 32, 17 years' experience, inventive ability to high degree, improves, develops machinery, technical education, designs labor saving devices, foremanship experience, not afraid to meet difficult propositions, wants position at once; any location; $30 per week for start. Box 281, AMERICAN MACHINIST.

OHIO

Foreman, tool room or general shop foreman, uptodate in modern shop methods and can produce results; good references; age 32. Box 277, AMERICAN MACHINIST.

Tool or model making foreman, good executive ability, solicits correspondence from uptodate firms in need of a live man. Box 276, AMERICAN MACHINIST.

Engineer, 32 years old, graduate of a German technical college, 10 years' practical experience, steam engine pumps, tools and mill weighing, used to control of men of different nationalities, possessor of several languages, desires appointment as superintendent or head foreman. Box 250, AMER. MACHINIST.

PENNSYLVANIA

First class draftsman, technical graduate, desires change. Box 278, AMER. MACHINIST.

Draftsman, experienced on gas engines and producers up to 200 horsepower, desires position. Box 275, AMERICAN MACHINIST.

Employment Wanted—A thoroughly capable man of twelve years' experience as shop foreman and draftsman, desires to locate as shop superintendent in a good town in Pennsylvania; best of references. Address "L.," 112 Church St., Plymouth, Penn.

Machine designer and production specialist, with 20 years' extensive experience, desires position with responsible firm; thoroughly conversant with foundry and machine shop costs; if you want maximum production at minimum expense, let me supervise your plant; best references. Box 274, AM. MACH.

WISCONSIN

Drop forging, technical and practical mechanic, executive, 10 years as die sinker, foreman and superintendent of drop shop, understand board, steam hammer bulldozer and forging machine work, age 37, open for an engagement January 1. Box 261, AM. MACH.

FOR SALE

Chicago manufacturing business of dies, presses, special and automatic can machinery; established trade with best concerns in United States; will deal with principals only; owner retiring. Box 272, AM. MACH.

For Sale—Successful uptodate plant, located in splendid city in Ohio, operating automatic screw machines in the production of special screws, nuts, etc.; $16,000 required; control owned by general manager and treasurer whose salary is $2700 can be purchased for $3000; an unusual opportunity for a man of ability with $3000 who can secure $13,000 outside capital. Box 251, AMER. MACHINIST.

An opportunity to start a machine shop; we offer one of our departments for sale, the one used to establish our business; it is small and profitable work, but as we are devoting ourselves to heavier work, we offer to sell for $2000, all the drawings, patterns, and stock of finished and partly finished parts and rough material (inventories over $3000), circulars, electrotypes, special machinery and fixtures, and an established trade. Address Sipp Machine Company, Paterson, N. J.

Talks With Our Readers

By the Sales Manager

AMERICAN MACHINIST:

Dear Sirs:—The Cleveland Automatic Machine Company are giving estimates on work, which up to the present time No. 442. I would like very much to get all of the numbers, that is, just the page 18. I have them from July 1st, 1910, and if you can furnish me with them as far back as you can, kindly let me know, and what they will cost me and I will give you the order.

Thanking you in advance for your trouble, I am,

Yours truly,

W. M. DALEY.

Detroit, Mich.

* * *

Here's a man who actually wants to buy the AMERICAN MACHINIST to get the advertising of one concern.

He has found out how to make advertising pay him.

* * *

There's no question whatever that good advertising of a good product is a profitable investment for the seller.

Though it is never profitable for the seller unless it is equally so for the buyer.

But oftentimes the buyer does not fully appreciate the advantage to him of reading the advertising pages.

To do more work, better work, bigger work, we must know the best methods to work by, the most economical tools to use.

Information—that's what you want—that's what everybody wants these days.

And the advertising pages of the AMERICAN MACHINIST are teeming with just the information you need about your work.

* * *

If there is a possibility that you can do something you have to do with less effort, or better than you are now doing it, it's good policy to find out about it.

If anyone has something that he says will help you—to boost your salary, or beat a competitor—to cut costs—or increase production, it's up to you to find out about it.

Get in the habit of reading the advertising pages—of using them.

You'll find them as interesting, as informative as any other section of the paper—you'll get acquainted with the products of the progressive concerns in the machine making field, find many a helpful suggestion, be better fitted to talk and think about the most economical and effective means of doing your work.

Read the ads—make them show you a profit every week.

* * *

Only reliable products can be continuously advertised.